

# INTEGRATED TECHNICAL SERVICES MARINE ENGINEERING



**CCGS Terry Fox**  
Dry-docking – Refit Revision #2  
F6855-181049  
Oct 22/18 – Jan 10/19



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## **PREAMBLE**

### **1. INTENT**

The intent of this specification shall describe the necessary work involved in carrying out the CCGS Terry Fox Drydocking and to complete the Annual Refit **Oct. 22/18 – Jan. 10/19**. All work specified herein and all repairs, inspections and renewals shall be carried out to the satisfaction of the Technical Authority/Owner's Representative and where applicable the attending TC Marine Safety Inspector. Unless otherwise specifically stated, the Technical Authority/ Owner's Representative is the Chief Engineer.

### **2. MANUFACTURER'S RECOMMENDATIONS**

The overhaul and installation of all machinery and equipment specified herein shall be as per the manufacturer's applicable instructions, drawings and specifications. The surface preparation, ambient limitations and coating applications shall be as per the manufacturer's instructions and specifications.

### **3. TESTING AND RECORDS**

All test results, calibrations, measurements and readings are to be recorded. Three typewritten copies, in English, are to be presented to the Technical Authority and one copy to the Project Authority within three days following the completion of the applicable work item. All tests are to be witnessed by the Technical Authority and where required, Transport Canada Marine Safety. The Contractor is responsible for contacting TC-MS when their presence is required for inspections or testing. The Contractor shall advise the Technical Authority in every case when Marine Safety arrives onsite for inspection of vessel's equipment or structure.

### **4. WORKMANSHIP**

The contractor shall use fully qualified, certified and competent tradesmen and supervision to ensure a uniform high level of workmanship as judged by normally accepted shipbuilding standards and to the Owner's satisfaction.

### **5. FACILITIES**

Quotation shall include all of the necessary labor and equipment required for the erection of access staging, rigging, lighting, tugs, pilotage, necessary crange and line handling.

### **6. MATERIALS AND SUBSTITUTIONS**

All material shall be supplied by the contractor and all materials shall be new and unused unless otherwise specified. All replacement material in the form of jointing, packing, insulation, small hardware, oils, lubricants, cleaning solvents, preservatives, paints, coatings, etc., shall be in accordance with the equipment manufacturer's drawings, manuals or instructions. Where no particular item is specified, or where substitution must be made, the Owner's representative must approve all material offered. Material data shall be provided in English to Chief Engineer.

## **7. REMOVALS**

Any items of equipment to be removed and subsequently reinstalled in order to carry out work specified or for access to carry out the work specified, shall be jointly inspected for damages prior to removal by both the contractor and Owner's representative.

## **8. EXPOSURE AND PROTECTION OF EQUIPMENT**

The contractor shall provide adequate temporary protection for any equipment or areas affected by this refit. The contractor shall take proper precautions to maintain in a proper state of preservation any machinery, equipment, fittings, stores or items of outfit which might become damaged by exposure, movement of materials, sand grit or shot blasting, welding, grinding, burning, gouging, painting or airborne particles of paint. Any damage shall be the responsibility of the contractor. Government furnished equipment and materials shall be received by the contractor and stored in a secure warehouse or storeroom having a controlled environment appropriate to the equipment as per the manufacturer's instructions.

## **9. LIGHTING AND VENTILATION**

Temporary lighting and/or temporary ventilation required by the contractor to carry out any item of this specification shall be supplied, installed and maintained in a safe working condition by the contractor and removed upon the completion of work.

## **10. CLEANLINESS**

The contractor shall at all times, maintain the work areas in which his personnel have access in a clean condition and free from debris. Dirt & debris generated by the spec items shall be cleaned up and removed from the vessel daily. Upon completion of this refit, the contractor shall ensure that the vessel is in a clean condition, free from all foreign material in any system or location placed there as a result of this refit. The contractor shall provide adequate temporary protection for any equipment or areas affected by this refit. The contractor shall dispose of any and all oil and water residue, which accumulates in the machinery space bilges as a result of any refit work detailed in this specification.

## **11. ASBESTOS**

Any and all insulation materials shall be asbestos free and approved for the required application.

## **12. ENTRY INTO ENCLOSED SPACES**

The contractor shall abide by the Coast Guard Enclosed Space Entry Policy. The policy is listed in the attached Safety Annex as section 7.0.9 and section 7.0.9 (N). Entry certificates shall clearly state the type of work permitted and shall be renewed as required by the regulations. Additional copies of these certificates shall be posted in conspicuous locations for the information of ship and contractor personnel.

A fire zone shall be established and naked lights shall not be used within this zone until "gas-free" certification has been issued.

The Contractor is to ensure that any work carried out in confined spaces as defined by the Canada Labor Code complies fully with all provisions of the code.

A number of spaces onboard the vessel are designated as Enclosed Spaces; these spaces are to be entered only under safe and controlled circumstances. The Contractor shall have in place an Enclosed Space Entry Permit system, equal to or better than the procedure contained in the Coast Guard's Safety Management System, section 7.D.9. Ship's breathing apparatus and EEBD's are not to be used except in an emergency.

The Contractor will maintain a log denoting the date, persons in the tank and times in and out. All forms and permits shall be completed in English.

## **13. Suspension Of Work**

The Technical Authority reserves the right to suspend work immediately when that work is being performed in contravention of the Coast Guard's Safety Management System.

Work shall be allowed to resume when the Technical Authority, in consultation with the Contractor and PWGSC, is satisfied that the agreed-upon procedures are in place and being adhered to.

## **14. HOTWORK**

Any item of work involving the use of heat in its execution requires that the contractor advise the owner's representative prior to starting such heating and upon its completion. The contractor shall be responsible for maintaining a competent and properly equipped fire watch during and for one full hour after all hotwork. The fire watch shall be arranged such that all sides of surfaces being worked on are visible and accessible. The contractor shall provide sufficient suitable fire extinguishers and a fire watch during any such heating and until the work has cooled. Ship's extinguishers shall not be used except in an emergency. The Contractor shall abide by the Coast Guard Hotwork Policy. The policy is listed in the attached Safety Annex as section 7.D.11 and section 7.D.11 (N). The contractor shall be responsible to ensure the contractor's personnel including any subcontractors shall follow the policy. All forms / permits shall be completed in English.

## **15. LOCKOUT AND TAGOUT PROCEDURES**

1. The Contractor shall be responsible to protect persons working on board the vessel while working on or near shipboard systems and equipment from accidental exposure to:

- electrical currents
- hydraulic
- pneumatic
- gas or steam pressure and vacuum
- high temperatures
- cryogenic temperatures
- radio frequency emissions
- potentially reactive chemicals
- stored mechanical energy
- equipment actuation

2. The contractor, under the supervision of the Chief Engineer and or the Electrical Officer, shall be responsible for the Lockout and Tagout of equipment and systems listed in the specification.

3. The Contractor shall supply and install all locks and tags and shall complete the Lockout Tagout Log sheet provided by the Vessel.

4. The Contractor shall remove all locks and tags and complete the Lockout Tagout Log sheet provided by the Vessel.

## **16. PAINTING**

All new and disturbed steelwork that will not be on the underwater wetted surface of the ship's hull is to be protected with two coats of Contractor supplied primer. Unless otherwise stated in the individual specification item, the primer is to be International Paints Interplate Zinc Silicate *NQA262INQA026* red. The paint is to be applied as per the manufacturer's instructions on their respective product data sheets. Finish coats are described in individual specification items. Finish coats are to be applied as per the manufacturer's instructions on their respective product data sheets.

## **17. WELDING**

Welding shall be in accordance with the Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)

The Contractor shall be currently certified by the Canadian Welding Bureau (CWB) in accordance with CWB 47.1 latest revision Division I, II or III at the time of bid closing.

The Contractor shall provide a current letter of validation from the CWB indicating compliance with standard CSA W47.1, Division I, II or III. (latest revision)

The Contractor may be required to provide approved procedure data sheets for each type of joint and welding position that will be involved in this refit.

The Contractor may be required to supply a current Welders Ticket for each individual welder that will be involved in this refit.

## **18. SMOKING**

The Public Service Smoking Policy forbids smoking in all Government ships in areas inside the ship where shipyard personnel will be working. The contractor shall inform shipyard workers of this policy and ensure that it is complied with.

## **19. RESTRICTED AREAS**

The following areas are out of bounds to shipyard personnel except to perform work as required by the specifications: all cabins, offices, Wheelhouse, Control Room, Engineer's office, public washrooms, cafeteria, dining room and lounge areas.

## **20. ELECTRICAL STANDARDS**

Any electrical installations or renewals shall be in accordance with the latest editions of the following marine standards:

(a) TP 127E-TC Marine Safety Electrical Standards.

(b) IEEE Standard 45 - Recommended Practice for Electrical Installation on Shipboard.

If any cable installed within this contract is found to be damaged, shorted or opened as a result of the manner of installation, the entire length of cable shall be replaced and installed at no cost to the Department. Plastic tie-wraps may be used to secure wiring in panels or junction boxes only.

## **21. DRAWINGS**

All drawings and drawing revisions that the contractor is requested to do in the execution of this contract shall be of a quality equal to that of the drawings that are requested to be updated. For example, drawings that have been lettered and dimensioned in a professional manner shall not be updated using freehand. Prints and reproductions that a contractor is required to provide shall be made on one piece of paper.

Sign off and acceptance of jobs will not occur until any and all drawings are updated to the satisfaction of the Owner's representative. All revisions shall be noted in English.

## **22. TRANSDUCERS**

The contractor shall not paint the transducers and all transducers shall be afforded the necessary protection during hull cleaning, blasting, burning, welding and coating operations.

## **23. OWNER'S REPRESENTATIVE**

Throughout this document, there is made reference to the Owner's Representative. For the purpose of this document, the Owner's representative is defined as the Chief Engineer of the Vessel.

## **24. Regulatory Authority Inspections**

The Contractor shall confirm a schedule of inspections with the regulatory authority (TCMS) for all work described in this specification and shall be responsible for calling them when inspections are required and for ensuring the work is credited by the regulatory authority in the Chief Engineer's 'Hull and Machinery Survey Book' .

The contractor shall ensure the Chief Engineer is informed when the regulating authority is onsite such that the Chief Engineer can witness the inspections by the regulating authority.

Notwithstanding any errors, omissions, discrepancies, duplication or lack of clarity in these project requirements, it shall be the responsibility of the Contractor to ensure that **the execution of the work specified herein is to the satisfaction of the Technical Authority.**

Inspection of any item by the Technical Authority does not substitute for any required inspection by Transport Canada Marine Safety (TC-MS).

## **25. Waste Oil Products**

Disposal of waste oil products shall be carried out by the Contractor, or subcontractor, who has been licensed by provincial authorities for the disposal of petroleum products. Copies of certificates must be produced upon request. This must be in accordance with the Coast Guard Policy for Handling Fuel, Oil, and Waste Oil Products, which is part of the Fleet Safety Manual, section 7.C.3. a copy of which is in the attached safety annex.

## **26. WHMIS**

The contractor shall provide current MSDS sheets for any WHMIS-controlled products used onboard or around the vessel at the start of the work period before the products are used. This includes at the minimum MSDS sheets for any solvents, cleaners, chemicals, coatings and blasting grits to be used. Any neutralizing chemicals or specialized protective equipment required shall be provided by the Contractor at all times these WHMIS-controlled products are onboard the vessel.

## **27. SAFETY ANNEX**

The Contractor shall follow the Coast Guard Policies as outlined in the attached Safety Annex. This Annex contains excerpts from the Fisheries and Oceans Canada, Canadian Coast Guard Fleet Safety Manual (DFO 5737) and deals with contractor responsibilities for items such as Hot Work, Confined Space Entry, Diving, Diving Operations, Contractor Safety & Security (10.A.7 FSM) and Drydocking.

An electronic copy of the Fleet Safety Manual (Adobe Acrobat .PDF version) can be found at

<http://142.130.14.20/fleet-flotte/Safety/maine.htm>

### Safety Familiarization

The Contractors Basic Safety Familiarization shall be completed for all contractors working on CCG vessels. It will verify that a basic safety briefing has been given, understood and acknowledged by the contractor. All contractors shall follow applicable OHS regulations in accordance with CCG safety/security/environmental requirements, fire alarm protocol and conduct to follow in case of fire or other emergency situations, familiarization of restricted areas and spaces, known risks and hazards encountered at the worksite ( ie asbestos, fire fighting systems, hazardous materials, flammables etc).

## **28. Data Book**

The Contractor is to produce two Data Books in English which shall list products, supplies and other purchases by the yard for this refit listing supplier and contact information. This book shall also include the copies of the readings required for the completion of each specification item. The data book shall be 8 X 12" format and binded. The data book shall be indexed and tabbed in the same order as the refit specifications index. Contractor shall also provide 3 CD-ROM's of the data book. The CD ROM's and data books shall be provided to the Chief Engineer prior to the end of refit.

### **SHIP'S PARTICULARS**

Length O.A. ----- 88.0 Metres  
Breadth MId. ----- 17.1 Metres  
Draft ----- 7.40 Metres  
Displacement ----- 4234 MT  
Power-----17,300 KW  
Engines-----Stork -Werkspoor 8TM 410 (x 4)  
Propulsion-----Diesel- Reducer Gearbox - CPP  
Year built ----- 1983

Spec item #: H-01	<b>SPECIFICATION</b>	TCMSB Field #: N/A
<b>Production Chart</b>		

## **H-01 Production Chart**

### **Part 1: Scope**

1.1 The intent is to provide a means for tracking the progress of the refit.

### **Part 2: References**

N/A

### **Part 3: Technical Description**

#### **Production Chart**

3.1 The successful Contractor shall supply three copies of a detailed bar chart showing the planned work schedule for the ship's refit. This bar chart shall show, for each specification item, the start date, the duration of work and the completion date. The chart is also to highlight any critical paths.

3.2 The production chart shall be updated weekly or for each production meeting to reflect the actual production on the refit and changes to the anticipated completion dates of each individual item.

3.3 The production chart shall clearly indicate the arrival/departure dates of any Subcontractors/Field Service Representatives.

3.4 The production chart shall include the status and production on each 1379 arising.

3.5 Three copies of the production chart shall be given to the Chief Engineer **the day prior** to each Production Meeting. A copy shall be emailed to the Project Authority ([wayne.lambert@dfo-mpo.gc.ca](mailto:wayne.lambert@dfo-mpo.gc.ca)) the day prior as well.

3.6 A copy of the original bar chart shall be provided via email to the PWGSC contracting Officer and Project Authority before the close of business on the day on the start date of the refit.

#### **Subcontractors with Allowances**

3.7 The Contractor shall provide a weekly update of the hours billed by the subcontractors along with their hourly rates.

3.8 The results shall be tabulated in an excel spreadsheet clearly indicating the Subcontractor, date(s), hours worked and hourly rate for the hours worked.

3.9 The update is to be emailed to Technical Authority, Contracting Officer and Project Authority the day prior to the weekly scheduled Progress Meeting.

#### **Part 4: Proof of Performance**

N/A

#### **Part 5: Deliverables**

5.1 Contractor shall provide a weekly production chart and excel spreadsheet for subcontractor allowances every week on the timelines indicated.

Spec item #: H-02	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Services		

**Part 1: SCOPE:**

- 1.1 The following services shall be supplied, fitted and / or connected upon arrival in the dry-dock, maintained throughout the dry-docking period and removed from the vessel on completion of the work period and undocked. The Contractor will be responsible for any additional connections required when the ship is moved between the dry-dock and alongside berth at the Contractor's facilities.
- 1.2 The services are required for the full Dry-dock period until undocked. Each item is to be priced separately.

**Part 2: REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

**2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

**2.3 Regulations**

- 2.3.1. Canada Shipping Act

## **2.4 Owner Furnished Equipment**

- 2.4.1.** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** The Contractor is to quote a global price and daily rates for all services supplied to the vessel during the dry-docking period.

### **READINGS AND REPORTS**

- 3.1.2.** Contractor shall collect and bind all readings and reports in a booklet form. Three (3) bound copies shall be delivered to the Chief Engineer at the end of the contracted refit period along with a CD-ROM or memory stick.

- 3.1.3.** The Contractor shall also send an electronic copy (CD-ROM or memory stick) to the Technical Authority prior to the end of the refit period.

### **ELECTRICAL POWER**

- 3.1.4.** Shore power facilities are to be supplied to the ship using a single 400-amp source using the Contractor's cables and fittings. The ship requires 1 x 400 amp x 600 VAC x 60 Hz x 3-phase power source for connection to the ship's shore power transformer. The Contractor will quote on supplying 6000 kW-hours per day. The Contractor will quote per kW hour for adjustment purposes on actual amount consumed.

- 3.1.5.** The meter readings are to be taken from the ship's shore power meter located on the main switchboard. The meter readings will be recorded by the Contractor and the Chief Engineer's designate at the time of connection and disconnection.

### **FIRE MAIN**

- 3.1.6.** Water shall be maintained to the vessel's fire main at a pressure of 550 kPa (80 psi) and be continuous 24 hours per day. The supply line shall be fitted with an isolating valve and a pressure-regulating valve (with pressure gauge) which will be located on the ship connected to the ship's international shore connection. Drains shall be fitted in the event of cold weather.

## **GANGWAYS**

- 3.1.7.** The Contractor will supply and erect 2 gangways, complete with safety nets, guardrails and adequate lighting to the satisfaction of the Commanding Officer. The main gangway will land on the aft deck, secondary gangway on the fore deck. The gangways are to be safe, well lit and structurally suitable for the passage of shipyard workers and ship's crew. The Contractor is to maintain the gangways in a safe condition throughout the duration of the dry-docking.
- 3.1.8.** The ship's gangway will not be used during the refit / dry-dock period except with the approval of the Commanding Officer and at no liability to CCG.
- 3.1.9.** Any movement of the gangways required by the Contractor will be at the expense of the Contractor.

## **INTERNET/PHONE**

- 3.1.10.** The Contractor shall provide unlimited high speed internet and phone service to the vessel for the duration of the refit period.
- 3.1.11.** The service will be active 24 hours per day for the duration of the contract.
- 3.1.12.** The Contractor will be responsible for giving notice for connection / disconnection of the telephones as required for any ship movements.
- 3.1.13.** The Contractor will supply a listing of shipyard telephone numbers, fire, police and emergency telephone numbers to the Chief Engineer when the ship arrives in the Contractor's yard.
- 3.1.14.** Long distance Canadian calling included.

## **POTABLE FRESH WATER**

- 3.1.15. The Contractor has completed the applicable paragraphs of the Safety Requirements before a connection to the vessel is made.**
- 3.1.16.** Potable water shall be supplied through a fresh water filling line (c/w reducing valve and pressure gauge) at the ship's fresh water connection located on the Main Deck (Frame 02) port or starboard side. Contractor to supply approximately 5 m<sup>3</sup> per day.
- 3.1.17.** Contractor will also supply any fresh water and / or hot water required for the cleaning, testing or flushing of tanks as required by the Specification from a source separate from the ship's potable fresh water connection.

## **SEWAGE CONNECTION**

**3.1.18.** Contractor to connect a 2.5” diameter connection pipe and hose to the sewage system overboard discharge, located between frames 112 & 113 starboard side. The discharge to be lead away from the ship’s side to the Contractor’s sewage outlet facilities. The connection to be removed on completion of docking.

**3.1.19.** Note: this connection to be made within 4 hours of ship dry-docking.

## **GARBAGE REMOVAL**

**3.1.20.** A suitable garbage container *with cover* is to be provided for the duration of the refit. The garbage container shall be a minimum of 6 m<sup>3</sup> and is to be placed on the Main Deck aft in a location agreed upon by the Contractor and the Chief Officer.

**3.1.21.** The ship’s garbage container shall be emptied at a minimum of every 3 to 4 days, more often if required by smell or capacity.

**3.1.22.** Garbage containers for use of the Contractor for disposal of debris etc. may be located on the Main Deck aft in locations agreed to by the Chief Officer. These containers shall be emptied on a regular basis.

## **BERTHING**

**3.1.23.** The berthing and mooring facilities are to be suitable for a vessel of this size and are to be to the satisfaction of the Commanding Officer.

**3.1.24.** During the contract period, if the ship is not in the dry-dock, the ship is to be berthed at the Contractor’s wharf at a safe and secure berth with adequate water at extreme low tide to ensure the vessel will not touch bottom.

**3.1.25.** The Contractor is responsible for all movements of the vessel during the contract period, including arrangements and costs for line handlers, tugs, pilot’s etc.

## **CLEANING**

**3.1.26.** The Contractor is to ensure all spaces, compartments and areas of the ship, external and internal, are left in an “as clean condition as found”.

**3.1.27.** The cost of removing dirt, debris and cleaning up work areas to the “as clean a condition as found” shall be included in each specification item.

## **OILY BILGE WATER**

**3.1.28.** The Contractor shall quote on removing 50 m<sup>3</sup> of oily-water from the ship's tanks, voids, bilges and compartments. The quotation is to include the cost of crantage, pumping, trucking and disposal of oily mixture. The Contractor is to provide the name of the firm contracted for the pumping and disposal of the waste oil.

**3.1.29.** Contractor will quote the cost of disposal of 1 m<sup>3</sup> to be adjusted up or down by PWGSC 1379 action. The Contractor will advise the Chief Engineer when oily bilge water is to be pumped out and a copy of the shipping manifest, indicating the volume of oily-water removed, is to be given to the Chief Engineer.

## **CRANAGE**

**3.1.30.** Contractor to bid on supplying general services of a dockside crane, driver and rigger for 20 hours during the dry-dock period as and when requested by the Chief Engineer. Contractor to quote an hourly rate for PWGSC 1379 adjustment purposes.

### **3.2 Location**

### **3.3 Interferences**

**3.3.1** Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

All work shall be completed to the satisfaction of the Chief Engineer.

### **4.2 Testing**

N/A

### **4.3 Certification**

N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

**5.1.1**

### **5.2 Spares N/A**

### **5.3 Training N/A**

### **5.4 Manuals N/A**

Spec item #: H-03	<b>SPECIFICATION</b>	TCMSB Field #: N/A
<b>Dock &amp; Sea Trials</b>		

**Part 1: SCOPE:**

- 1.1 The intent of this specification is to have the Contractor onboard to perform a minimum of three hours dockside trials, and six hours of continuous sea trials.
- 1.2 The intention of the dock trials is to run up the affected machinery during the past refit (M/E, shafting, etc.) to operating temperatures and pressures, check for abnormal vibrations and temperatures, record operating parameters from the main gearbox and main engine. The load is limited on the main engine while at the dock to ensure no damage to the shafting, propellers, rudders, etc, occurs.
- 1.3 The intention of the sea trial is to run for 4 hours at the maximum pitch permitted by the Chief Engineer.

**Part 2: REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

2.1.1 N/A

**2.2 Standards**

2.2.1 The Coast Guard Standards / technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards / bulletins shall be obtained from the Chief Engineer.

**2.3 Regulations**

2.3.1 This ship is regulated by Transport Canada and all work must be approved by them, and subjected to the inspection of the attending TCMS Surveyor and Chief Engineer.

**2.4 Owner Furnished Equipment**

2.4.1 The Contractor shall supply all materials, equipment, labor, and parts to perform the specified work unless stated otherwise.

**Part 3: TECHNICAL DESCRIPTION:**

**3.1 General**

- 3.1.1 On completion of all specification items and after the vessel has been undocked, dock trials shall be carried out at the contractor's facility. Note, Coast Guard shall provide the date as to when the vessels crew shall return to vessel to assume care and custody and be available for conducting trials.
- 3.1.2 The vessel shall be given 36 hours to run up the vessel after it has been undocked before trials begin.

- 3.1.3 The Contractor shall ensure there are sufficient personnel (4) onboard to attend to/repair any faults directly related to the equipment worked on by the Contractor during the refit.
- 3.1.4 The Contractor shall ensure the workers available perform dock trials with the amount of pitch, ahead, astern movements being limited to what the Owner's Representative feels is a safe level. This shall be performed for four hours to allow everything to rise to operating temperatures and settle out. Once this is deemed to be satisfactory by the Chief Engineer and TCMS Inspector, the sea trials shall be scheduled.
- 3.1.5 Sea trials shall be scheduled for six hours and the contractor shall ensure there are sufficient workers available to attend to any repairs required to affected machinery.
- 3.1.6 The 1205 Acceptance document shall not be signed by the Chief Engineer until the Sea Trials have been successfully completed to the satisfaction of the Chief Engineer.

### **3.2 Location**

#### **3.2.1**

### **3.3 Interferences**

- 3.3.1 The contractor shall be responsible for the identification of all interference items, their temporary removal, storage, and refitting to the vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

- 4.1.1 All work shall be completed to the satisfaction of the Chief Engineer and TCMS Surveyor.

### **4.2 Testing**

- 4.2.1 These sea trials are to prove the integrity of all the machinery / systems worked on by the Contractor during the past refit, and shall be included in the reports delivered to the Chief Engineer.

### **4.3 Certification**

- 4.3.1 N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

- 5.1.1 The operating condition of the equipment worked on shall be included in the three copies of the work reports in electronic format from the Contractor to the Chief Engineer at the end of refit.

#### **5.2.1 Training N/A**

#### **5.3.1 Manuals N/A**

Spec item #: H-04	<b>SPECIFICATION</b>	TCMSB Field #: N/A
<b>Anchors &amp; Chain Survey</b>		

## **Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to perform maintenance, inspection, and rotate bitter ends of the port and starboard anchors and chain. To obtain a TCMSB survey credit for the anchors and chain.
- 1.2 This work shall be carried out in Conjunction with the following:
  - Chain Locker Maintenance

## **Part 2: REFERENCES:**

### **2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. Anchor Weight 3.5 metric tons
- 2.1.2. Chain length 15 shots per side
- 2.1.3. One shot of chain weight is 1.3 metric tons
- 2.1.4. Anchor chain diameter is 46 mm.

### **2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT
- 2.2.9. Coast Guard Paint Scheme

### **2.3 Regulations**

- 2.3.1. CSA

### **2.4 Owner Furnished Equipment**

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** Contractor shall lower the port and starboard anchors and chains to the dock floor. The chains shall be ranged on the dock floor using Contractor's lifting equipment and suitably supported to allow for high pressure water washing. The initial lowering of the anchors & chains to the dock floor and the final stowing of anchors & chains is done using the ship's windlass operated by ship's crew. Contractor is to advise the Chief Engineer 24 hours in advance of either operation to ensure ship's personnel are available.
- 3.1.2.** Work on this specification item to be carried out in conjunction with H – 0 including the requirement for a marine chemist's certificate for confined space entry and hotwork.
- 3.1.3.** Contractor to high-pressure fresh water wash (approx. 5000 psi) anchors and chains to remove all sand, mud and marine growth.
- 3.1.4.** The chains are to be inspected by MSB and Chief Engineer's designate prior to painting. All links are to be inspected and slack studs or missing lead pellets identified and reported to Chief Officer. Repairs to six (6) slack studs to be shown as a separate cost.
- 3.1.5.** Anchor swivels shall be replaced with new CG Supplied swivels. Anchor shanks shall be rotated on anchor connecting pins in crowns to prove freedom of motion – approx. 35° either side of vertical.
- 3.1.6.** Contractor to quote separately on the following work: both anchor chains to be let go at the bitter end flanges. Each bitter end flange is located directly under a warping head. Once the bitter end flanges are unbolted, the windlass can be used to lift up on the bitter ends and secure for unbolting of chains. The first 2 shots of the port and starboard chains (anchor ends) are to be disconnected and rotated to the position of the last shots (bitter ends). The free ends are to re-connected to anchors with babbitt pellets. Center shackle pins are to be sealed, chains secured at the bitter ends and bitter end flanges bolted in place using a 3 mm neoprene gasket at each location.
- 3.1.7.** Note: the requirement to carry out this work will be decided by Coast Guard after the chain inspection.
- 3.1.8.** Before painting the joining shackles, the anchor chains are to be grit swept to remove surface rust. The anchor chain shall have the diameter of several links measured and recorded. Measure 10 links per shot of chain on port and starboard systems. The joining shackles are to be painted with 2 coats of red paint with equal numbers of white painted links on either side. The number of white painted links are to correspond with the number of shots of chain paid out beginning from the anchor-joining shackle. The outer links of each white-painted set are to be marked by stainless steel seizing wire close-hitched around the link stud.
- 3.1.9.** The anchors are to be grit swept to remove surface rust. Contractor to apply 2 coats of black paint to each anchor.
- 3.1.10.** Paint coatings shall be Amercoat 5450 high gloss alkyd. Primer shall be Amercoat 5105 Alkyd Primer.

**3.1.11.** On completion of above work, cables and anchors to be re-shipped using ship's windlass.

**3.1.12.** Note: before ship's windlass is used, Chief Officer will be advised and all grit blasting debris will have been removed from the windlass' exposed gears by the contractor.

### **3.2 Location**

**3.2.1.** Forward Foc'sle Deck

### **3.3 Interferences**

**3.3.1** Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

**4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer.

**4.1.2.** TCMSB shall inspect anchors and chains to obtain a five year survey credit.

### **4.2 Testing**

N/A

### **4.3 Certification**

N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

**5.1.1**

### **5.2 Spares**

N/A

### **5.3 Training**

N/A

### **5.4 Manuals**

N/A

Spec item #: H-05	<b>SPECIFICATION</b>	TCMSB Field #: N/A
<b>Chain Lockers</b>		

**Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to open up chain lockers for cleaning, abrasive blasting, painting, UT testing and inspection by TCMSB
- 1.2 This work shall be carried out in Conjunction with the following:
  - Anchors and Chains
  - Void space Cleaning and Inspection

**Part 2: REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. Burrard and Yarrows Windlass Arrangement Including Pockets Drawing # 31-00-01

**2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

**2.3 Regulations**

- 2.3.1.

**2.4 Owner Furnished Equipment**

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** The port & starboard chain locker hatch cover is located on the Foc'sle Deck just aft of the anchor windlass; port of centerline frames 144 - 145. Contractor shall lower each anchor and cable to the dry-dock floor until the cable reaches the bitter end.
- 3.1.2.** The volume of each chain locker is 94 m<sup>3</sup> with a total internal surface area of 162 m<sup>2</sup> including the division plate. Chain locker shall be certified safe for confined space entry and hot work by a marine chemist for the duration of this work.
- 3.1.3.** Contractor is advised the false floor gratings are very heavy and their movement for cleaning purposes will require lifting equipment. Some form of staging may be required to access the upper levels for cleaning, abrasive blast and painting purposes.
- 3.1.4.** Contractor shall cut access holes on the port and starboard side of the windlass to access both sides of the chain locker. Access holes shall be located where old cuts have been used. The false floor plates shall be removed to be shipyard shop to be abrasive blasted and coated.
- 3.1.5.** The entire internal surface of the chain lockers shall be abrasive blasted to SSPC-SP 10 / NACE # 2 (Sa 2 ½). Pump suction shall be plugged during blast and clean up. Extraction units shall be used during blasting and coating.
- 3.1.6.** All grit, mud and other loose material shall be removed ashore. The mud boxes and strainers shall be proven clear. Chain locker pump is located in the Bubbler Compartment. The port and starboard pump suction piping shall be uncoupled and the piping proven clear to the satisfaction of the Chief Engineer.
- 3.1.7.** Contractor to quote on removing 250 liters of dirt & debris per bilge suction (500 liters total). NOTE – this amount does not include any accumulated water from the cleaning of the chain locker.
- 3.1.8.** The bottom of the chain lockers shall be UT tested. Locations will be identified with paint marker. Allow 200 shots to be tested with emphasis on the perimeter adjacent to bulkheads and bilge suction wells.
- 3.1.9.** The chain lockers shall be inspected by TCMSB and Chief Engineer's designate prior to painting.
- 3.1.10.** The entire internal surface of the chain lockers and the gratings shall be coated with International Paint products: one coat primer – Intertuf JVA 202 (non-black) and two finish coats – Intertuf JBA 016 (contrasting colors per coat).
- 3.1.11.** Bilge strainer plates shall be cleaned and holes reamed. Strainers shall be painted with one coat of Intertuf JVA 202.
- 3.1.12.** False floor gratings shall be reinstalled in their original location. Access holes and inserts shall be prepared for re-fitment and welded in as per TCMSB regulations. TCMSB shall inspect the fit up and the final welded inserts. Welds shall be 100% UT. Damaged coating from welding shall be repaired as per surface preparation and coating of the chain lockers.
- 3.1.13.** All materials and staging shall be Contractor (CFM) supplied.

**3.1.14.** After paint has cured a final inspection by ship's staff the anchors and cables shall be re-stowed. This also includes completed work of anchors and cable maintenance. Ship's staff will assist using anchor windlass.

**3.1.15.** Chain locker hatch cover to be closed up in good order.

### **3.2 Location**

**3.2.1.** Below Foc'sle Deck Frame 144-150 Port and Starboard of Centerline

### **3.3 Interferences**

**3.3.1** Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

**4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer.

**4.1.2.** TCMSB shall inspect the chain locker before coating is applied. The space shall be gas freed certified when surveyor enters chain locker.

### **4.2 Testing** N/A

### **4.3 Certification** N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

**5.1.1**

### **5.2 Spares** N/A

### **5.3 Training** N/A

### **5.4 Manuals** N/A

Spec item #: H-06	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Freshwater Tank Maintenance		

**Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to open up the two freshwater tanks for cleaning, inspection and testing. The tanks are currently coated with Royal Coatings.
- 1.2 This work shall be carried out in Conjunction with the following:

**Part 2: REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. Tank Capacity Plan Drawing # T131027
- 2.1.2. Potable Freshwater Internal Tank – Volume -42 m<sup>3</sup>
- 2.1.3. Freshwater Tank # 6 Double Bottom Center –Volume - 108 m<sup>3</sup>
- 2.1.4. Royal Coating Spec Sheets

**2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

**2.3 Regulations**

- 2.3.1.

**2.4 Owner Furnished Equipment**

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** The following work shall commence as early as possible in the contractor's work schedule.
- 3.1.2.** The tanks shall be pumped as low as possible by ship's staff. Contractor shall be responsible for pumping out remainder of tank as required to perform this work.
- 3.1.3.** The contractor shall provide each tank with effective mechanical systems to meet environmental conditions for the surface preparation and coating application. The contractor shall prove the tanks are safe for personnel to enter prior to commencing work in each tank.
- 3.1.4.** There are two (2) manhole covers for access to # 6 DB center tank, one manhole for access to main potable water tank. Contractor shall open all manhole covers for access for water / mechanical cleaning and painting purposes. On completion of all work, manhole covers shall be installed using new 1/4" neoprene gaskets (CFM).
- 3.1.5.** Prior to entry into tank, the tank shall be certified safe for entry and hotwork.
- 3.1.6.** During tank cleaning and painting operations, Contractor shall provide protection to any internally mounted tank level transducers. Before closing up tanks, the Chief Engineer will confirm condition of tank level transducers.
- 3.1.7.** The tanks shall be hydro blasted and chemically cleaned to remove rust discoloration, mud, scale and loose paint. All water and debris shall be removed from the tank. There are no docking plugs in these tanks and water accumulated from pressure washing must be pumped out using Contractor supplied equipment. The chemical used shall be approved by the Provincial Health Services for its intended application. Proof of such approval shall be furnished to the Chief Officer before work begins.
- 3.1.8.** Tank surfaces shall be thoroughly dried before mechanical cleaning and painting.

#### Coating

- 3.1.9.** The surface preparation and coating shall be applied as per attached Royal Coating Specification for Freshwater Tanks. The three stage coating system consists of EasyPrep, EasyPrime, and EasyFlex.
- 3.1.10.** Contractor shall supply all ventilation and dehumidification equipment to ensure the complete drying of the first and second coats, and to protect against condensation and humidity.
- 3.1.11.** The contractor shall quote on repairing 100 m<sup>2</sup> of coating. Quote shall include unit cost per m<sup>2</sup> for the repair and shall be used for adjustment by 1379 for the total area to be repaired. The above quote shall include surface preparation and coatings. Before coating begins the contractor and Chief Officer will inspect the tanks to agree on the total area involved.
- 3.1.12.** The contractor shall perform all coating repairs in strict accordance with Royal Coating Instructions.

- 3.1.13. IMPORTANT NOTE:** The NACE Inspector will supervise and advise on the entire coating process, including proper coating type, coating dry- film thickness, proper preparation and application environment and procedures, and drying time to complete cure. The contractor shall obtain copies of the following information sheets for the paint or coating product system selected and provides copies to the local CCG representative for inclusion in the Contract file.  
Working Procedures;  
Product data sheets; and  
Material Safety Data (MSD) sheets
- 3.1.14.** On completion of the surface preparation and before the first coat of paint or coating product has been applied, the contractor shall provide the crown with a statement certifying that the surface preparation was completed in accordance with the Manufacturer's instructions. Any deviations to those instructions shall be noted in the certified statement.
- 3.1.15.** Ambient air temperature of the tank shall be constantly monitored during the application and curing period using an electronic data recorder. Temperatures shall be recorded hourly, and printouts submitted as part of the contract deliverables.
- 3.1.16.** Paint application shall not take place when the metal temperature is less than 3 Degrees Celsius above the dew point
- 3.1.17.** The following information shall also be recorded and submitted as part of the contract deliverables:  
Space Temperature and relative humidity level in the tank – before work is started;  
The tank shall be allowed to remain stagnant for 48 hours before samples are taken;  
Two (2) water samples shall be collected from inside the tank. Sampling means shall be provided.  
Two (2) air samples shall be collected from inside the tank;  
One (1) blank air sample shall be collected from somewhere outside the tank;  
Once samples have been taken, the tank shall be purged and left empty until results are received; and  
The air and water samples listed above shall be sent to an accredited laboratory for analysis  
The Contractor shall have the air samples, identified above, tested for VOCs  
The Contractor shall have the water samples, identified above, tested for:  
All parameters identified in paragraph 3.6.7 section 7.F.12 of the fleet Safety Manual;  
1-2-4 Trimethylbenzene – 0 ug/L limit;  
Diglycidyl ether – 0 ug/L limit;  
Expoxypropyl ether – 0 ug/L limit;  
Other identified chemicals of concern, based on the MSD sheets.
- 3.1.18.** Contractor shall arrange for services of a Marine Chemist to monitor and record VOC levels in tank atmospheres during cure period.

- 3.1.19. After paint has fully cured, tanks shall be super-chlorinated with bleach and circulated to a level of 50 mg/L of free chlorine for disinfection and let sit for 4 hours. Contractor shall supply Chief Engineer with calculations used to determine strength of chlorine solution used and number of containers used.
- 3.1.20. The super-chlorinated water must then be de-chlorinated to a free chlorine level below 0.1 mg/L as per the requirements of the CCG Fleet Safety Manual section **7.F.12.POTABLE WATER QUALITY**, paragraph 3.5 inclusive. Tanks shall be drained by Contractor again to remove all traces of the sterilizing agent.
- 3.1.21. **Note:** Contractor shall take three (3) separate water tests while pumping out the de-chlorinated water. **NOTE:** to ensure the mixture is properly de-chlorinated, the mixture shall be thoroughly circulated.
- 3.1.22. Tanks shall be filled and pumped out twice more. Contractor shall ensure that all hoses and pumps used during this operation are for fresh water use only. A certificate stating this requirement must be given to the Chief Engineer.
- 3.1.23. After the tank flushing and refilling has been completed and the tank filled again, and let set for 24 hours. Contractor shall arrange to have samples of the water in each tank tested by a laboratory. Tests shall include those for Coliform, E.Coli, and Volatile Organic Compounds. The water sample reports shall be delivered to the Chief Engineer. The water from the tanks shall not be used for ships consumption until receipt of acceptable drinking water certificates.
- 3.1.24. A report of the super-chlorination and de-chlorination calculations and tests shall be given to the Chief Engineer.
- 3.1.25. The contractor shall perform hydrostatic test on each of the tanks for TCMSB. This can be done in conjunction with the chlorination process of the spec item. The vent heads shall be removed for the test and replaced with new gasket when completed.

### 3.2 Location

- 3.2.1. Freshwater Tank 40 ton Frames 9 – 25
- 3.2.2. Freshwater Tank #6 DB Center Frames 9 - 27

### 3.3 Interferences

- 3.3.1 Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### 4.1 Inspection

- 4.1.1. All work shall be completed to the satisfaction of the Chief Engineer.

### 4.2 Testing

As per Fleet Safety Manual

Note: Technical and testing requirements:

- that the paint chosen for use to coat or patch a tank be a 100% solids, VOC free, product that is certified to NSF-61
- that the application of the coating system must be specified to be in accordance with paint manufacturer's recommendations.
- that all new equipment be specified to be used in the application of the coating
- that the contractor is to require that anyone entering the tanks takes precautions to ensure they do not contaminate the tanks
- that the contractor is to schedule an early start to the preparation and coating work to allow sufficient time for the coating to cure
- that an independent third party NACE certified inspector (with a minimum certification of Coating Inspector Program Level 2) be engaged to verify the work throughout the process and that the specification requires the contractor to provide the NACE inspector access to conduct inspections.
- that a baseline 28 parameter water quality test is to be performed per Section 7.A.12 of the Fleet Safety Manual following super chlorination.
- that another 28 parameter test be done at least 3 days following the baseline test with the water in the tank having remained stagnant between tests.

#### 4.3 Certification

All water Analysis required by the specified work

### Part 5: DELIVERABLES:

#### 5.1 Drawings/Reports

##### 5.1.1

#### 5.2 Spares

N/A

#### 5.3 Training

N/A

#### 5.4 Manuals

N/A

Spec item #: H-07	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Above Waterline Hull Coating & CCG Identity		

### **Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to sweep blast the entire above waterline hull, repair and apply coatings, including the draft marks and Coast Guard identity as described below. Remove weld bead from the hull that perimeters the old Coast Guard Identity.
- 1.2 This work shall be carried out in Conjunction with the following:
  - Anti-friction Underwater Hull Coating

### **Part 2: REFERENCES:**

- 2.1 **Guidance Drawings/Nameplate Data**
  - 2.1.1. Shell Expansion
  - 2.1.2. CCG Identity Program Drawings
- 2.2 **Standards**
  - 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
  - 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
  - 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
  - 2.2.4. Coast Guard ISM Hotwork procedures
  - 2.2.5. Coast Guard ISM Fall Protection procedures
  - 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
  - 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
  - 2.2.8. SSPC-SPT
- 2.3 **Regulations**
- 2.4 **Owner Furnished Equipment**
  - 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

### **Part 3: TECHNICAL DESCRIPTION:**

- 3.1 **General**

**3.1.1.** The Contractor shall abrasive blast clean the entire above waterline hull area to SSPC-SP 6 standard and paint same area as described below. All areas from 10 m above baseline to bulwarks or exterior deck level, as applicable, are to be dealt with:

- Stern roller to frame 65 – 10 m to top of bulwarks (including stern roller)
- Frame 65 – 123: 10m – 13.5 m (up to Foc'sle Deck)
- Frame 123 – Stem: 10m – 14.5 m (to top of bulwarks)
- All measures taken to prevent undesirable ingress of blast grit into ships openings, machinery and equipment. The contractor shall plug deck scuppers and discharges as well as take other measures necessary to prevent any liquids from contaminating areas being prepared or coated. The contractor shall also take measures to ensure that no damage, unnecessary cleaning, or any repairs result from either the hull preparation process or coating application. Measures shall be taken to ensure that surfaces and equipment, other than those specified, are not coated and that the coating shall not block any inlets or discharges in the shell. Deck machinery and other gear shall be protected from damage by grit and coatings.

**3.1.2.** The total area involved for blasting and painting is approximately 500 m<sup>2</sup> (5382 ft<sup>2</sup>).

#### **Anchor Pockets**

**3.1.3.** The anchor pockets shall be completely abrasive blasted to SSPC-SP10 to achieve an anchor profile of 2 -3 mils. The contractor shall quote on 10 M<sup>2</sup> for each pocket.

**3.1.4.** The contractor shall apply two coats of Amercoat 238 Abrasion Resistant Epoxy at 10 mils DFT per coat with sufficient feathering, color red.

#### **Surface Preparation**

**3.1.5.** Abrasive Blast the entire area as describe in section 3.1.1 to SSPC-SP-6. The total area is 500 M<sup>2</sup>. Abrasive blast damaged areas to SSPC-SP-10 and feathered back to intact coating. Quote 50M<sup>2</sup> for damaged areas and include unit cost for 1 M<sup>2</sup> to be adjusted up or down by 1379. Cost of damaged areas shall include the primer coating

#### **Primer**

**3.1.6.** Apply two coats of Amercoat 5105 Primer to damaged areas with contrasting colors. Apply @ 2 to 3 mils DFT per coat.

#### **Topcoat**

**3.1.7.** Apply two full coats of Amercoat 5450 Topcoat to entire area. Apply @ 2 to 3 mils DFT per coat. Colour Coast Guard Red (509-102).

**3.1.8.** Contractor to paint hull markings as per Coast Guard supplied drawings for Identity Program.

- 3.1.9.** Coast Guard hull markings, including logos, ship's name, stripes, port of registry and all other hull markings are to be painted with 2 coats of Amercoat 5450 Topcoat-White paint. CCG will supply stencils as required.
- 3.1.10.** The interface with the under water hull coating and the above waterline hull coat line shall be coated with a 300mm overlap of above water line hull coating.
- 3.1.11.** All coatings shall be in strict accordance with manufacturer's application instructions.
- 3.1.12.** After completion of work all protective covers, plugs etc. are to be removed and stencils are to be returned to Chief Officer.
- 3.1.13.** Man-lift and or scaffolding shall be made available to CCG representative to witness all thickness readings.

### **3.2 Location**

- 3.2.1.** Exterior Hull Above Water Line

### **3.3 Interferences**

- 3.3.1** Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

All work shall be completed to the satisfaction of the Chief Engineer.

### **4.2 Testing**

The contractor shall provide DFT readings to the owners representative following each coat. The owners representative shall witness the readings as they are taken. In conjunction with any functional quality assurance procedure, the following points will be carried out:

- Provide a list of batch numbers with corresponding dates of manufacture.
- Record the quantity and type of any solvent added.
- Measure and record the ambient conditions.
- Record details of spray tips and pressures.
- WFT guage readings to be taken on a regular basis during application.
- Using a calibrated DFT guage, fifteen (15) measurements per 100 square ft. are to be taken and recorded. Upon agreement of consistency with the Chief Engineer, fifteen (15) measurements per 1000 square ft. are to be taken and recorded.
- All recorded information is to be typewritten and three (3) copies are to be given to the Chief Engineer.

### **4.3 Certification**

N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

**5.1.1** Contractor is to provide a written report to the Chief Engineer detailing the information as per 4.2 -Testing.

**5.2 Spares**  
N/A

**5.3 Training**  
N/A

**5.4 Manuals**  
N/A

Spec item #: H-08	<b>SPECIFICATION</b>	TCMSB Field #: N/A
5 Ton Crane Inspection		

## Part 1: SCOPE:

- 1.1 The intent of this specification shall be to have the 5 ton crane inspected for TCMSB and obtain a 5 year survey credit.
- 1.2 This work shall be completed under the supervision of the FSR from East Coast Hydraulics. An allowance of \$15,000 shall be bid for this service, to be adjusted up or down by PWGSC 1379 action upon proof of invoice.

## Part 2: REFERENCES:

### 2.1 Guidance Drawings/Nameplate Data

- 2.1.1. Jacobs Brothers Crane Corp. / East Coast Hydraulics Ltd  
Model: JM1908  
Fixed Boom Dual Luffing Cylinders  
Hydraulic Winch  
Hydraulic Slewing  
Main Motor: 50 HP, 460 Volts, 3 Phase, 60 HZ  
Hydraulic Oil Capacity: 350 Liters  
Oil Type: Petro Canada MV 22 Hydraulic Oil  
Authorized Service Rep: East Coast Hydraulics,  
Contact – Tim O’Connor, General Manager  
Tel: 709 747-2121  
Cell: 709 689-5767  
Email: toconnor@eastcoasthydraulics.ca

### 2.2 Standards

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

## **2.3 Regulations**

### **2.3.1. TC Tackle Regulations**

## **2.4 Owner Furnished Equipment**

**2.4.1.** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** Before disassembly of any parts a rocking test shall be performed to measure the deflection of the slewing bearing. This shall be measured at four positions 90° equally. A weighted load shall be used to measure the deflection with the boom angle at a specified position.
- 3.1.2.** The hook assembly, load cell, and anti-2-block assembly shall be removed from the winch cable and stored in a safe location for reuse. The cable shall be removed from the winch and discarded. A new CCG supplied cable shall be installed following the crane work and refitted with the hook assembly and load cell.
- 3.1.3.** The two wire rope sheaves on the boom head shall be removed for inspection. The sheave pin locks shall be removed and laid aside for reuse. The pins shall be removed from the sheaves and the sheaves removed from the boom head. The pins and sheaves shall be transported to the yards shop for cleaning, inspection, and measurements. The pins bores in the boom head shall be cleaned and then covered to prevent corrosion flash over while the pins are removed. The sheave pins and bushings shall be thoroughly cleaned and grease passages proven clear. The pins and bushings shall be measured to determine diametrical clearance.
- 3.1.4.** The hydraulic hoses for the dual hydraulic rams shall be disconnected and capped on both ends. The pins for the dual hydraulic rams attached to the boom and the crane tower shall be removed for inspection. The hydraulic rams shall be supported and removed to a safe location. The pin bores shall be cleaned, measured, and then covered for protection. The pins and shall be transported to the yards shop for cleaning, inspection, and measurements. The grease passages shall be proven clear. The diametrical clearance of the pins and bushings shall be determined. The pins support bores shall be cleaned and then covered to prevent corrosion flash over while the pins are removed.
- 3.1.5.** The boom heel pin shall be removed for inspection. The boom shall be supported during the pin removal and following the pin removal the boom shall be lifted from the crane tower and laid aside on support cradles for further maintenance. The boom pin bushings shall be shall be cleaned and measured. The pins support bores shall be cleaned and then covered to prevent corrosion flash over while the pins are removed.

- 3.1.6.** The welds located in areas where stress is concentrated (ie pin supports and doubler plates) shall be NDT. The welds shall be buffed cleaned to allow a technician to apply NDT materials (mag-flux or dye). Allow for 200 linear feet of welds to be tested. Following the testing the areas shall be wire brushed cleaned and coated with two coats of Alkyd Primer Amercoat 5105 and two top coats of Alkyd Gloss Topcoat Amercoat 5450 Coast Guard Buff.
- 3.1.7.** The ring of 54 bolts, nuts, and washers that secure the crane slewing bearing shall be replaced with new CCG supplied. The bolts are M24x180mm 10.9 grade. Nuts are 10.9 grade and washers are hardened. Seating surfaces for bolt head and nuts shall be wire brushed cleaned. Bolts shall be torqued to manufacturer's specification in a specified pattern.
- 3.1.8.** The ring of 54 bolts, washers, and spacers that secure the crane to the tower shall be replaced with CCG supplied new. Bolts are M20x140mm 10.9 grade. Washers and spacers are hardened. Seating surfaces for bolt head and nuts shall be wire brushed cleaned. Bolts shall be torqued to manufacturer's specification in a specified pattern.
- 3.1.9.** The ring of 24 bolts, nuts, and washers that secure slewing motor/rotation gearboxes to the crane shall be replaced with CCG supplied new. There are two slewing motor/rotation gearboxes fitted to the crane and both shall be dealt with the same. Seating surfaces for bolt head and nuts shall be wire brushed cleaned. Bolts shall be torqued to manufacturer's specification in a specified pattern.
- 3.1.10.** The contractor shall be given an allowance of \$5000.00 for hydraulic hoses and fittings. This shall be adjusted by 1379 following proof of invoice. The contractor shall replace all exterior hoses on the crane. All fittings shall be plugged or capped where hydraulic hoses have been disconnected. These are connected to the slewing motors, filter housing, rotary coupling, winch, solenoid block, and hydraulic rams. Allow for 15 hoses to be replaced vary in sizes from 1 inch to 1/2 inch diameter. The interior hoses shall be inspected to determine their condition and replace as necessary. All hoses and fittings shall have the same ratings as existing. Following the installation of new hoses and testing, all fittings shall be wrapped with Denso brand petroleum tape with sufficient overlap on the hose and housing connectors.
- 3.1.11.** The slip ring housing cover shall be opened for inspection by the ship's Electrical Officer. The cover gasket shall be replaced with a new gasket of the same material as the existing. The cover shall be replaced when the Electrical Officer is satisfied with his/her findings.
- 3.1.12.** Contractor shall take UT shots of the boom in areas specified by the FSR. Allow for 100 shots over the length of the boom.
- 3.1.13.** While the boom is removed the rusty areas of the crane's exterior coating shall be powered tool cleaned to remove rust and scale. This shall include the boom, crane tower, operators cab and attachments. All bare areas shall be coated with two coats of Alkyd primer Amercoat 5105 contrasting colors. Two coats of topcoat Alkyd Gloss Amercoat 5450, CCG Buff, shall be applied. Contractor shall be allow 5 M<sup>2</sup> area for coating preparation and repair. A unit cost per M<sup>2</sup> shall be included for additional area.

- 3.1.14.** The hydraulic oil shall be changed out with new oil, Petro Canada MV 22 hydraulic oil. The new oil shall be pumped in the tank through a 3 micron filter element. The old oil shall be discarded. The oil in the slewing motor/rotation gearboxes shall be changed out with new CCG supplied oil. Oil type and capacity to be determined by the FSR. The oil in the winch gearbox shall be changed out with new CCG supplied oil. Oil type is gear oil 150, 3 liter capacity. The return and pressure filters for the hydraulic system shall be changed out with new CCG supplied elements.
- 3.1.15.** The gear teeth of the slewing motors pinions and main slewing gear shall be greased by applying manually. These are located inside the crane tower above the motor and tank.
- 3.1.16.** The crane shall be completely reassembled in the reverse order. All pins and bushings shall be pre-greased before assembly and greased through normal grease channels following assembly. Pins shall be locked in the same method as originally found. The load measuring device and A2B safety device shall be tested and proven for correct operation.
- 3.1.17.** The crane shall then be load tested at 1.5 times the SWL and perform additional tests as directed by the TCMSB inspector and the FSR. Contractor shall provide the necessary weights and rigging to perform the tests. The test shall be witnessed by TCMSB and the FSR.

## **3.2 Location**

- 3.2.1.** Starboard Main Deck at Frame 60.

## **3.3 Interferences**

- 3.3.1** Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

- 4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer, FSR, and TCMSB.

### **4.2 Testing**

- The crane shall be load tested as specified.
- A rocking test shall be performed on the crane to measure the deflection of the slewing bearing.

### **4.3 Certification**

N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

**5.1.1** The contractor shall provide reports of all measurements and findings in one hard copy and electronic format.

### **5.2 Spares** N/A

### **5.3 Training** N/A

### **5.4 Manuals** N/A

Spec item #: H-9	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Fixed Fire Systems Inspection		

**Part 1: SCOPE:**

- 1.1 Contractor shall arrange for inspection, testing and recertification of all ship's fixed and portable fire extinguishing systems, as described and listed below, by an authorized service provider. Proof of credentials and certification of service provider shall be made available to Chief Officer.

**Part 2: REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. N/A

**2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)

**2.3 Regulations**

- 2.3.1. Canada Shipping Act

**2.4 Owner Furnished Equipment**

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

**Part 3: TECHNICAL DESCRIPTION:**

**3.1 General**

- 3.1.1. Contractor shall have an allowance of \$10000 for the services of a certified technician to inspect and provide inspection certificates for all items listed and \$5000 for parts to be adjusted up or down via 1379 action upon proof of invoices.
- 3.1.2. No components or parts shall be replaced without the prior consent of the Chief Officer. Any parts replaced shall be turned over to Chief Officer. Inspection and testing of all equipment shall be witnessed by a senior ship's Officer.
- 3.1.3. All certificates and service reports issued by the Contractor for this work must refer to each serviced component's serial number and location on the vessel. The inspection and certification is to be conducted in accordance with the manufacturer's standards, with the following work requirements to be addressed as part of, or as supplementary, to the standards.

**Notifier Systems**

- 3.1.4. The vessels equipped Notifier AM 2020 Fire Alarm system shall be thoroughly examined by a qualified technician and inspection certificates issued. The service provider must be certified by Notifier for this inspection activity and must

produce the documentation for verification. The inspection and testing is to be witnessed by a Senior Officer.

- 3.1.5. All smoke and heat detectors are to be verified and tested.
- 3.1.6. All bell circuits, pull stations, relays, monitors are to be verified and tested.
- 3.1.7. The panels and alarm functions are to be inspected and tested and all zones inspected.

#### **FM-200 System**

- 3.1.8. Eight (8) independent, Kidde fixed FM-200 fire extinguishing systems shall be thoroughly examined by qualified technicians and inspection certificates issued. Systems shall be inspected to current TCMSB standards and as per current Kidde FM-200 marine maintenance manuals for “ECS Series” and “ADS Series” FM-200 systems. Service provider must be currently certified by Kidde for this inspection service and must produce documentation to verify same.
- 3.1.9. All manual and electric pull cables shall be inspected and tested.
- 3.1.10. All gas piping shall be inspected, blown through, proven clear and pressure tested.
- 3.1.11. All sirens, horns and bells shall be inspected and tested.
- 3.1.12. All gas cylinders shall be weighed and Net weight determined and recorded.
- 3.1.13. All time delay functions shall be tested and proven correct.
- 3.1.14. All pressure activated switches for fire alarm initiation shall be tested.
- 3.1.15. All pressure activated switches for shutdown functions shall be tested.
- 3.1.16. Contractor to visually inspect all FM200 bottles at deck level for possible excessive amounts of corrosion or rust accumulation of exterior of bottles. Chief Engineer shall be advised immediately if any problems are found.
- 3.1.17. System shall be properly reassembled in good working order. All cylinders shall be firmly secured in their respective mountings. Three (3) typewritten copies Inspection certificates shall be submitted to the TA and the Chief Engineer.
- 3.1.18. Final inspection of completed work shall be undertaken by Contractor’s charge hand in the presence of the designated ship’s Officer. All work shall be to the satisfaction of the Chief Officer and TCMSB.
- 3.1.19. **Galley Fire Suppression System**
- 3.1.20. The Kidde RANGE GUARD MODEL RG - 2.5G c/w 2.21 gal. Karboly fire suppression system shall be serviced and tested and inspected in accordance with Kidde Wet Chemical Fire Systems manual, 2006. Service provider must be Kidde certified.
- 3.1.21. Contractor shall test and prove clear the piping and nozzles and ensure there are no foreign materials in the piping system that could prevent these systems from working correctly. All piping support brackets shall be verified in place and correctly fastened.
- 3.1.22. Contractor shall inspect cylinder, cylinder valve and control head assembly. Cylinder should not show evidence of corrosion or damage. Cylinder charge shall be determined and verified correct. All functions and adjustments of control head shall be verified correct.
- 3.1.23. Remote manual release pull station and actuating cable shall be proven functional.

**3.1.24.** All fusible links (three of 360°) must be renewed with new links with the correct temperature rating.

**3.1.25.** All system control functions must be proven functional such as Fan shut down, range and fryer shut down, alarm initiation etc.

**3.1.26.** The system shall be returned to working order.

**Gaylord Ventilator**

**3.1.27.** Galley Temperature sensing device for Gaylord Ventilator system shall be tested and proven functional.

**3.1.28.** Temperature actuated ventilator damper shutdown and alarm function shall be tested and proven functional.

**Paint Locker CO2 System**

**3.1.29.** Paint locker cabinets are fitted with an independent 25 lb CO2 flooding system with local, manual release. This system shall be inspected similarly to all others.

**3.1.30.** Bottle and head shall be inspected, bottle charge shall be confirmed, all discharge piping and nozzles shall be proven clear.

**3.2 Interferences**

**3.3.1** Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

**Part 4: PROOF OF PERFORMANCE:**

**4.1 Inspection**

**4.1.1.** All work shall be completed to the satisfaction of the TA.

**4.2 Testing**

**4.3 Certification**

**Part 5: DELIVERABLES:**

**5.1 Drawings/Reports**

**5.1.1** Contractor is to provide service reports for all inspected systems identifying defects discovered and rectified. Certificates are to be provided for all systems.

**5.2 Spares**

**5.3 Training**

**5.4 Manuals**

Spec item #: H-10	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Replace Fire Main Pipe in #5 Starboard Wing Tank		

## **Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to replace the section of fire main pipe from the main deck, through #5 Starboard Wing Tank into the upper room at frame 35.
- 1.2 This work shall be carried out in Conjunction with the following:
  - HD-13 Fuel Tank Cleaning and Inspection

## **Part 2: REFERENCES:**

### **2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. 70-02-02 Sheet 2 Fire and Deck Wash Arrangement

### **2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

### **2.3 Regulations**

- 2.3.1. Hull and Construction Regs
- 2.3.2. Fire Detection and Extinguishing Equipment Regs

### **2.4 Owner Furnished Equipment**

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** The section of pipe and flange shall be cropped and replaced with new. The pipe extends from the flange 80mm above the main deck, down through the main deck into # 5 starboard FO Wing Tank, inboard to penetrate the bulkhead in the upper Mud Room. The pipe end in the Mud Room is grooved Victaulic. The penetration compensating ring shall be cropped with the pipe and replaced with new.
- 3.1.2.** The pipe inside the tank shall be all welded construction, no breakdown couplings. The pipe shall be schedule 80 steel, 3inch Ø. Allow for 10 feet of steel pipe and one elbow.
- 3.1.3.** Refer to reference drawing for penetration details and all work shall comply with drawing details. All penetration welding, including pipe shall have NDT performed. TCMSB shall inspect all welding.
- 3.1.4.** The tank shall be air tested as part of the fuel tank cleaning and inspection work.

### **3.2 Location**

- 3.2.1.** Frame 35 Starboard Main Deck at ships side
- 3.2.2.** # 5 Starboard FO Wing Tank
- 3.2.3.** Longitudinal Bulkhead Upper Mud Room frame 35

### **3.3 Interferences**

- 3.3.1** Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

- 4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer.

### **4.2 Testing**

- NDT reports shall be given to Chief Engineer and TCMSB Inspector

### **4.3 Certification**

N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

**5.1.1** The Contractor is to provide a written report to the Chief Engineer detailing the information of the work performed with this item.

### **5.2 Spares N/A**

### **5.3 Training N/A**

### **5.4 Manuals N/A**

Spec item #: H-11	<b>SPECIFICATION</b>	TCMSB Field #: N/A
FM200 Bottle Inspection & Testing		

## **Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to transport specified FM200 cylinders and associated Pilot cylinder to OEM facility for inspection and hydro-testing.
- 1.2 This work shall be carried out in Conjunction with the following:
  - Fixed Fire System Inspection

## **Part 2: REFERENCES:**

### **2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. Kidde FM200 Inventory
- 2.1.2. K-45-101\_print\_AB
- 2.1.3. Kidde 600\_lb\_FM-200\_Cylinder\_10-7-14
- 2.1.4. Kidde FM-200 ECS Series Engineered

### **2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

### **2.3 Regulations**

- 2.3.1. MSC.1/Circ. 1432

### **2.4 Owner Furnished Equipment**

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

**Part 3: TECHNICAL DESCRIPTION:**

**3.1 General**

- 3.1.1.** The contractor shall obtain the services of an authorized services company for FM200 systems to supervise in the removal and replacement of the cylinder. An allowance \$25,000.00 shall be given for the services of the FM200 service company and \$10,000 for shipping to be adjusted up or down following proof of invoice.
- 3.1.2.** The contractor shall disconnect the following bottles from the vessel and transport to the authorized Kidde facility for service, inspection, and testing. Include the removal and replacement of the contents and transport back to the vessel as originally found.
- 3.1.3.** Kidde FM200 System:

<b>CCGS Terry Fox Kidde FM 200 System</b>			
<b>Location and Serial #</b>	<b>Bottle Size</b>	<b>Bottle Capacity</b>	<b>FM200 Agent Weight</b>
<b>Paint Locker Pull Main or Reserve Discharge to Activate</b>			
<b>Paint Locker</b> #1 Main FM Bottle (G) AA270419	58.36" X 16"	150-350 lb. 142 Litre 158.5 kg	72 kg
<b>Paint Locker</b> #2 Pilot Cylinder (G)	12" X 3.5"	108 in <sup>3</sup>	n/a
<b>Incinerator Room System Pull Main or Reserve Discharge to Activate</b>			
<b>Incinerator Room</b> #1 Main FM Bottle (G) AA270554	35.93"X12.75"	54-125 lb. 51 Litre 56.5 kg	35 kg

<b>Incinerator Room</b> #2 Pilot Cylinder (G)	12" X 3.5"	108 in <sup>3</sup>	n/a
<b>Upper and Lower Main Engine Room</b> <b>Pull Main or Reserve Discharge to Activate</b>			
<b>FM200 Storage Comp.</b> <b>Aft Deck Starboard Side.</b> For Main Engine Room Main Bottles AA268922 (G)	70" X 24"	390 – 900 lb. 368 litre 408 kg	196 kg
<b>Port side entrance cat walk</b> Port Uptakes (for Main Engine Room) AA267202 (G)	70" X 24"	390 – 900 lb. 368 litre 408 kg	249 kg
<b>FM200 Storage</b> Pilot Cylinders (G) Driver Cylinders (G)	25" X 8" 60" X 10"	1040 in <sup>3</sup> 4070 in <sup>3</sup>	n/a
<b>Emergency Generator Compartment</b> <b>Pull Main or Reserve Discharge to Activate</b>			
<b>Emergency Gen. Room.</b> #1 Main bottle AA271384 (G)	52.75" X 12.75"	86 – 200 lb. 81 litre 90.5 kg	53 kg
<b>Emergency Gen. Room</b> #2 Pilot Cylinder (G)	12" X 3.5"	108 in <sup>3</sup>	n/a
<b>Bubbler Comp.</b> <b>Pull Main or Pull Pilot Pin (wait 30 sec's then) Pull Pin on Main Bottle</b>			
<b>Fwd Machinery Space</b> <b>Fwd Bulkhead Port</b> #2 Main Cylinder AA268924 (G)(P)	70" X 24"	390 – 900 lb. 368 litre 408 kg	189 kg
#3 Pilot Cylinder (G)(P)	12" X 3.5"	108 in <sup>3</sup>	n/a
<b>Fwd Upper and Lower Machinery Space</b> <b>Pull Main or Reserve Discharge Cylinder</b>			

<b>Forward Upper Machinery Space Fwd Bulkhead Port</b> #1 Main Bottles (2) AA267235 (G)	70" X 24"	390 – 900 lb. 368 litre 408 kg	197 kg
#2 Large Pilot Cylinder(G)	25" X 8"	1040 in <sup>3</sup>	n/a
<b>Fwd Upper Machinery Space Center</b> #4 Main Bottle (For Work Shops) AA279046 (G)	35.93"X12.75"	54-125 lb. 51 Litre 56.5 kg	36 kg
<b>Lower Fwd. Machinery Comp.</b> #5 Main Bottles AA269570 (G)	56.72" X 22"	258 – 600 lb. 243 litre 272 kg	136 kg
<b>Aft Upper and Lower Machinery Spaces Pull Main or Reserve Discharge to Activate</b>			
<b>Mud Room Fwd Port</b> #1 Main Bottle AA267216 (G)	70" X 24"	390 – 900 lb. 368 litre 408 kg	223 kg
#3 Large Pilot Cylinder (G)	25" X 8"	1040 in <sup>3</sup>	n/a
<b>Aft Lower Machinery Comp.</b> #5 Main Bottle AA276699 (G)	35.93" X 12.75"	54 – 125 lb. 51 Litre 56.5 kg	54 kg
<b>Mudroom Aft Center</b> #1 Main Bottle AA270593 (G)(P)	35.93" X 12.75"	54 – 125 lb. 51 Litre 56.5 kg	32 kg
# 3 Pilot Cylinder (G)(P)	12" X 3.5"	108 in <sup>3</sup>	n/a
<b>Stern Thruster Compartment Pull Main or Pull Pilot Pin (wait 30 sec's then) Pull Pin on Main Bottle</b>			
<b>Mudroom Aft Center</b> #1 Main Bottle AA270593 (G)(P)	35.93" X 12.75"	54 – 125 lb. 51 Litre 56.5 kg	32 kg
# 3 Pilot Cylinder (G)(P)	12" X 3.5"	108 in <sup>3</sup>	n/a

3.1.4 The inspection and testing shall comply with MSC.1/Circ. 1432.

3.1.5 A detailed report of the inspection and findings from the authorized manufacturer of the systems shall be provided to the vessel and TCMSB.

**3.2 Location**

3.2.1 As per above table.

**3.3 Interferences**

3.3.1 Contractor is responsible for all the identification of interference items, their temporary removal, storage and refitting to vessel.

**Part 4: PROOF OF PERFORMANCE:**

**4.1 Inspection**

4.1.1 All work shall be completed to the satisfaction of the Chief Engineer.

**4.2 Testing**

4.2.1 The system shall be inspected / Tested to the satisfaction of the Chief Engineer and TCMS.

**4.3 Certification**

All Certificates shall be given to the Chief Engineer before Refit ends.

**Part 5: DELIVERABLES:**

**5.1 Drawings/Reports**

5.1.1 The Contractor is to provide a written report to the Chief Engineer detailing the information of the work performed with this item.

**5.2 Spares  
N/A**

**5.3 Training  
N/A**

**5.4 Manuals  
N/A**

Spec item #: H-12	<b>SPECIFICATION</b>	TCMSB Field #: N/A
<b>Lifeboat and Davit Annual Inspection</b>		

**Part 1: Scope:**

**1.1** The intent of this specification shall be for the contractor to supply the services of a Palfinger Marine Representative to carry out annual inspection on the vessel's Lifeboat and Lifeboat Davit in accordance with Palfinger Marine procedures and checklists.

**1.2** This work shall be carried out in conjunction with the following:

H-13 Annual Inspection, Starboard Miranda Davit.

**Part 2: References:**

**2.1 Guidance Drawings/Nameplate Data**

**2.2 Standards**

**2.3 Regulations**

**2.3.1 N/A**

**2.4 Owner Furnished Equipment**

2.4.1 The contractor shall supply all materials, equipment, labour and parts required to perform the specified work unless otherwise stated.

**Part 3: Technical Description:**

**3.1 General**

**3.1.1.** The contractor shall supply the services of a Palfinger Marine representative to supervise annual inspection on the Lifeboat and Davit in accordance with Palfinger Marine procedures and checklists. Summary inspection of key components to be carried out as quickly as possible to identify critical path, and possible purchase of long-lead items.

3.1.2 Contact information for the FSR: ryan.fagan@palfingermarine.com

**3.1.3** The Contractor shall inform Chief Engineer of testing and inspecting times.

**3.1.4** The Lifeboat Davit shall be locked out by ship's Electrical Officer.

**3.1.5** Contractor shall inspect for damage to the Fibreglass reinforced laminate (FRP) both inside and out. All hull penetrations and steering mechanisms shall be inspected for wear and correct operation.

- 3.1.6** Contractor shall drain oil from the winch gear case and remove gear case cover. Contractor shall inform the Chief Engineer if there is any water content showing in the used oil. Contractor shall inspect the gear case for wear and damage. Contractor shall measure and record all backlash on all internal gears. Contractor shall remove winch from bedding for blast inspection and Thickness Measurements. Bedding shall be primed with 2 coats Marine GRADE primer and winch re-installed with contractor supplied fasteners.
- 3.1.7** Contractor shall prove that the gear case vent is free and clear and functioning properly to prevent internal pressure. Contractor shall flush the gear case with new oil until all residue water and dirt is removed. Contractor shall fit the gear case oil drain plug with pipe sealant and fill the gear case to the correct operating level with ship supplied oil. Contractor shall replace the gear case cover with a new gasket. Oil shall be vessel supply.
- 3.1.8** Contractor shall dismantle the winch brake assemblies to gauge wear and check for signs of heat. This will include dismounting the manual hand brake and centrifugal brake assembly from its shaft. Brake linings and centrifugal brake pads shall be inspected for wear and damage. Brake lining retaining screws shall be inspected. Centrifugal brake springs shall be inspected for wear and damage. Wear measurements of the brake linings shall be recorded and compared to manufactures specifications, if measurements are below specifications Contractor shall renew brake linings.
- 3.1.9** Contractor shall clean all parts including any brake dust from brake housing. Contractor shall de-glaze the running contact surfaces of the centrifugal brake drum housing and the hand brake inner cone clutch by machining them true. Contractor shall check with the manufacturer to obtain the minimum rotor thickness tolerance.
- 3.1.10** Contractor shall re-assemble brake assemblies using Loctite on the all brake lining securing screws. After re-assembly the breaks shall be adjusted to correct setting. Davit shall be lowered under load to test operation of the brakes after all work on davit completed.
- 3.1.11** Any replacement parts will be Owner-supplied.

## **3.2 Location**

- 3.2.1.** The Lifeboat and Davit are located on the starboard side of the Foscle deck.

## **3.3 Interferences**

- 3.3.1.** Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: Proof of Performance**

### **4.1 Inspection**

**4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer.

### **4.2 Testing**

**4.2.1.** Davits are to be functionally tested in accordance with Palfinger Marine procedures and checklists.

### **4.3 Certification**

**4.3.1.** Instruments or accessories required to perform testing of davits shall be certified and calibrated (i.e. loads cell or stones used to test davit structure)

## **Part 5: Deliverables:**

### **5.1 Drawings/Reports**

**5.1.1** The contractor shall arrange for the Palfinger Marine FSR and shall provide three typewritten reports detailing the inspections and his findings to the Chief Engineer.

### **5.2 Spares**

### **5.3 Training**

### **5.4 Manuals**

Spec item #: H-13	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Miranda Davit Annual Inspection		

**Part 1: Scope:**

**1.1** The intent of this specification shall be for the contractor to supply the services of a Palfinger Marine Representative to carry out annual inspection on the vessel's Miranda Davit.

**1.2** Contractor shall bid with an allowance of \$40k, to be adjusted up or down by 1379 action, for the services of the Palfinger Marine Field Service Representative to supervise the inspection of the Miranda Davit.

**1.3** This allowance encompasses FSR services for both H-12 and H-13. The Contractor shall allow one labourer and one millwright for 120 hours EACH to assist the Palfinger Marine FSR for work encompassed in H-12 and H-13.

**1.4** This work shall be carried out in conjunction with the following:

**1.4.1.** H-12 Annual Inspections, Lifeboat and Davit

**Part 2: References:**

**2.1 Guidance Drawings/Nameplate Data**

**2.2 Standards**

**2.3 Regulations**

**2.3.1 N/A**

**2.4 Owner Furnished Equipment**

**2.4.1** The contractor shall supply all materials, equipment, labour and parts required to perform the specified work unless otherwise stated.

**Part 3: Technical Description:**

**3.1 General**

**3.1.1** Summary inspection of key components to be carried out as quickly as possible to identify critical path, and possible purchase of long-lead items.

**3.1.2** Contact information for the FSR: ryan.fagan@palfingermarine.com

3.1.3 The Contractor shall inform Chief Engineer of testing and inspecting times.

3.1.4 Any replacement parts will be Owner-supplied.

### **3.2 Location**

The Miranda Davits are located on the port side of the foc'sle deck.

### **3.3 Interferences**

Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: Proof of Performance**

### **4.2 Inspection**

All work shall be completed to the satisfaction of the Chief Engineer.

### **4.3 Testing**

Davits are to be functionally tested in accordance with Palfinger Marine procedures and checklists.

### **4.3 Certification**

**4.3.1.** Instruments or accessories required to perform testing of davits shall be certified and calibrated (i.e. loads cell or stones used to test davit structure)

## **Part 5: Deliverables:**

### **5.1 Drawings/Reports**

**5.1.1** The contractor shall arrange for the Palfinger Marine FSR and shall provide a typewritten report in electronic format detailing the inspections and his findings to the Chief Engineer.

### **5.2 Spares**

### **5.3 Training**

### **5.4 Manuals**

Spec item #: H-14	<b>SPECIFICATION</b>	TCMSB Field #: N/A
<b>Liferaft Annual Inspection</b>		

**Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to have five Liferafts inspected, serviced, and recertified for TCMSB requirements.
- 1.2 This work shall be carried out in Conjunction with the following:

**Part 2: REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. Life Saving Plan – (78) 1003
- 2.1.2. Liferafts:
  - (a) 25 persons, Type DBC, Serial # XDC5FJ32B313
  - (b) 25 persons, Type DBC, Serial # C/208
  - (c) 6 persons, Type Zodiac, Serial # XDC8EV38D909
  - (d) 25 persons, Type Zodiac, Serial # XDC7EY24A010-D
  - (e) 25 persons, Type Zodiac, Serial # XDC16089I112

**2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

**2.3 Regulations**

- 2.3.1.

**2.4 Owner Furnished Equipment**

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

**Part 3: TECHNICAL DESCRIPTION:**

**3.1 General**

- 3.1.1. The five Liferafts shall be removed from the Foc'sle Deck and transported to an OEM facility that is approved by Transport Canada Marine Safety Branch.
- 3.1.2. Upon completion of servicing and recertification the rafts shall be returned to the vessel and reinstalled in its original cradle.
- 3.1.3. The service date shall be stamped near the end of the refit period.
- 3.1.4. The removal/installation and transportation of the liferafts shall form part of the Contractors bid.
- 3.1.5. Contractor to allow \$15,000.00 in the bid cost for inspection and recertification costs of the sub-contractor. Final cost shall be adjusted on receipt of invoice from the service provider by 1379 procedure.

**3.2 Location**

- 3.2.1. Port and Starboard Foc'sle Deck.

**3.3 Interferences**

- 3.3.1 Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

**Part 4: PROOF OF PERFORMANCE:**

**4.1 Inspection**

- 4.1.1. All work shall be completed to the satisfaction of the Chief Engineer.

**4.2 Testing**  
N/A

**4.3 Certification**

The original Certificates of re-certified rafts shall be given to the Chief Engineer.

**Part 5: DELIVERABLES:**

**5.1 Drawings/Reports**

- 5.1.1 contractor shall provide a typewritten report in electronic format detailing the inspections and his findings to the Chief Engineer.

- 5.2 Spares  
N/A**
- 5.3 Training  
N/A**
- 5.4 Manuals  
N/A**

Spec item #: H-15	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Repair Cracked Weld on 40 Ton Crane		

**Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to repair a cracked weld on the support arm that connects from the crane tower to the operators cab support.
- 1.2 This work shall be carried out in Conjunction with the following:

**Part 2: REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. Support Arm: 6" x 2" x 1/2" Channel closed at crane tower end.

**2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

**2.3 Regulations**

- 2.3.1.

**2.4 Owner Furnished Equipment**

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

**Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** The contractor shall grind out a section of cracked welding approximately 2 inches long on the underside of the channel support arm connected to the crane tower. The area of the crack is identified by blue paint.
- 3.1.2.** The ground out section of weld shall be re-welded.
- 3.1.3.** The entire weld on the channel support arm shall be power tooled cleaned to bare metal. NDT shall be performed on the entire fillet weld. Allow for 4 feet of weld to be cleaned and tested.

### **3.2 Location**

- 3.2.1.** 40 Ton Crane Tower IWO winch drum.

### **3.3 Interferences**

- 3.3.1** Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

- 4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer.

### **4.2 Testing**

- NDT shall be performed on specified area.

### **4.3 Certification**

Welders shall be CWB certified.

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

- 5.1.1** Provide report of NDT and work performed on crane in electronic format.

### **5.2 Spares** N/A

### **5.3 Training** N/A

### **5.4 Manuals** N/A

Spec item #: HD-01	<b>SPECIFICATION</b>	TCMSB Field #: N/A
<b>Drydocking</b>		

**Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to drydock the vessel for regulatory inspections, maintenance and installation of new equipment as specified in the refit specification for the drydocking.
- 1.2 This work shall be carried out in Conjunction with the following:

**Part 2: REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. Docking Plan Drawing # 00-00-08

**2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

**2.3 Regulations**

- 2.3.1. Hull Construction Regulations

**2.4 Owner Furnished Equipment**

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** The vessel shall be docked and undocked and a suitable number of Lay Days shall be included to perform the work described herein as well as a margin of time to cover work arising as specified by the contract. Contractor to quote unit cost per Lay Day. All manpower, materials, tugs, pilots etc. required to carry out the work shall be supplied by the Contractor and shall be to approval of the Chief Engineer.
- 3.1.2.** A docking plan is available on board the vessel and will be provided to the successful Contractor. Contractor will be responsible to ensure drawing is returned to vessel upon completion of work.
- 3.1.3.** The underwater external hull of the vessel shall be surveyed by TCMSB for credit.
- 3.1.4.** The bow overhang shall be supported by at least 1 bow shore. The bow shore is not to be removed until just before ship is undocked. Contractor to prepare keel and margin blocks and fit the necessary breast and bow shores to maintain the true alignment of the ship's hull and equipment for the dry-docking period.
- 3.1.5.** The vessel shall be dry-docked such that dry-docking plugs, sea bays, inlet grids, anode plates and transducer orifices are clear of the blocks. Any movement of the blocks necessary for sandblasting and/or painting or removal of docking plugs shall be the responsibility of the Contractor. Contractor shall quote on moving 10 blocks. Contractor to quote on moving 1 block for prorating purposes.
- 3.1.6.** Docking shall be undertaken during the first three days of the contract period. The Contractor shall prepare the dock in advance of the ship's arrival and the official start of the dry-docking. If premium time is required for evening shifts or weekend work to meet this objective, the Contractor is to identify this and include all costs in his quotation.
- 3.1.7.** The vessel shall not to be placed in the same dock with any other ship for any part of the contract period. A minimum clearance of 5' shall be available below the keel.
- 3.1.8.** Contractor shall bid a price for hourly rates for tugs and/or pilot services as required. This shall be adjusted as necessary as per required 1379 action.
- 3.1.9.** Contractor shall be responsible for the safe transfer of the ship from the pre-docking berth or location onto its docking blocks. During docking, radio contact shall be maintained between the vessel's Commanding Officer and the Contractor's docking master.
- 3.1.10.** Within 8 hours of docking, cleaning shall commence on the underwater hull by high-pressure fresh water washing (6000 psi minimum) to remove all marine growth and allow preliminary inspection.
- 3.1.11.** Prior to commencing water blasting, all hull mounted equipment and openings shall be fully protected.
- 3.1.12.** The Contractor shall give the Chief Engineer a minimum of 4 hours advance notice before adding / removing fluids from any ship's tanks.

**3.1.13.** Adequate and safe access to the vessel shall be provided through a minimum of 2 gangways, complete with safety nets, lights, and rails, throughout the drydocking period.

**3.1.14.** Any contamination of the vessel's hull by materials (i.e. oil) present in the dock shall be cleaned, after the vessel is re-floated and clear of the dock, at the Contractor's expense and to the satisfaction of the Chief Engineer.

### **3.2 Location**

#### **3.2.1.**

### **3.3 Interferences**

**3.3.1** Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

**4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer.

### **4.2 Testing**

N/A

### **4.3 Certification**

N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

**5.1.1** The Contractor shall provide a report in electronic format to Chief Engineer of all work performed with this item.

### **5.2 Spares**

N/A

### **5.3 Training**

N/A

### **5.4 Manuals**

N/A

Spec item #: HD-02	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Underwater Hull Inspection & Coating		

## **Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to clean, repair coating, and inspect the hull of the vessel. The whole underwater area of the ship's hull is coated with abrasion resistant coating products.
- 1.2 This work shall be carried out in Conjunction with the following:
  - Hull Impressed Current System
  - Rudder and Rudder Stock Removal
  - Port Propeller and Tailshaft Removal
  - Overboard Discharges
  - Seabox and Seabay Maintenance
  - Freshwater Tank Maintenance

## **Part 2: REFERENCES:**

### **2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. Intershield 163 Inerta 160
- 2.1.2. Intergard\_822\_eng\_A4\_20160519
- 2.1.3. Elliptical Anode Area Prep
- 2.1.4. Docking Plan

### **2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT
- 2.2.9. Coast Guard paint Scheme

## **2.3 Regulations**

### **2.3.1.**

## **2.4 Owner Furnished Equipment**

**2.4.1.** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** The present area of the hull is AMERCOAT 238 anti-friction hull coating, including complete underwater surface area and up to the 10 m level above keel ( up to and including the fender), stern roller, forward and aft along knuckle chine to just below (but extending up to include areas of anchor pockets) is approximately 3500 m<sup>2</sup> (37,675 ft<sup>2</sup>). Care to be taken during blasting and painting operations that stern roller bearing arrangement is protected by blocking off area between closing plate and roller. Roller can be turned by inserting bar in socket holes on starboard side of roller.
- 3.1.2.** The entire underwater area of the ship from the keel to the top of the light water line shall be hydro blasted and cleaned of all marine growth and salts. This shall include rudder, propellers, and thruster tunnel. The cleaning shall be done immediately after the vessel is dry-docked.
- 3.1.3.** The entire underwater hull shall then be inspected by the Chief Engineer, TCMSB Hull Surveyor, and a supervisory representative from the contractor. The contractor shall plan a suitable date and time for the hull inspection. The contractor shall inform the Chief Engineer 24 hours prior to the inspection time. All parties involved in the inspection shall be present for the inspection. The contractor shall supply and erect staging/scaffolding/manlift as required for the inspection.
- 3.1.4.** Following any required hull repairs the contractor shall make repairs to areas where the hull coating is missing as directed by the Chief Engineer.
- 3.1.5.** In order to avoid any confusion as to the total area to be repaired, the contractor shall assign a representative, who along with the owner's representative to view the ship as it sits on the blocks subsequent to cleaning but prior to coating repairs. The representatives shall view the ship and agree upon the total area of the hull that shall be repaired and coated.
- 3.1.6.** The contractor shall plug deck scuppers, discharges, as well as take other measures necessary to prevent any liquids from contaminating areas being prepared or coated. Before commencement of grit blasting activities, Contractor is responsible for preventing the ingress of grit & other air blown debris through all openings in the ship, including the following:
- Stern tubes, shafting and propellers.
  - Sea bays & sea inlet grids.
  - All bubbler discharge nozzles.
  - All overboard discharge valves.

- Engine room supply and exhaust fans which cannot be closed with louver doors.
- All void and tank vents.
- Anchor windlass, especially exposed gears, incl. control station.
- Tugger winches & control stations.
- Winches & exposed cables on 40 T & 5T cranes.
- Rudder gland.

Porthole glasses in the hull to be covered with minimum ¼” masonite or plywood and sealed with duct tape on perimeter. The contractor shall also take measures to ensure that no damage, unnecessary cleaning, or any repairs result from either the hull preparation process or coating application. Measures shall be taken to ensure that surfaces and equipment, other than those specified, are not coated and that the coating shall not block any inlets or discharges in the shell. Deck machinery and other gear shall be protected from damage by grit and coatings.

- 3.1.7.** All traces of grit used for blast cleaning, shall be removed by the contractor. The contractor shall be responsible and liable for ensuring that the hull is clear and clean prior to, during and immediately after the coating application.
- 3.1.8.** Abrasive blast material shall not be permitted to enter any part of the vessel. The contractor shall ensure that every opening into the vessel where grit may gain entry is covered.
- 3.1.9.** The Coast Guard will provide the services of a NACE inspector to supervise the surface preparation, environmental condition monitoring, mixing, and application of the coating.
- 3.1.10.** The contractor shall provide all means to ensure the environmental conditions are correct for applying Intershield 163 Inerta 160. The total area is 3500 M<sup>2</sup>

#### **Surface Preparation**

- 3.1.11.** Abrasive Blast all bare and rusted areas to SSPC-SP-10 Near White Metal. Abrasive blast the entire hull area as reference in 3.1.1 to remove all the Amercoat coating until the old existing Inerta coating is exposed. All edges of intact Inerta coating shall be feathered back to accept new coating. .

#### **Topcoat**

- 3.1.12.** Apply one full coat of Intershield 163 Inerta 160 to the entire surface of the hull as referenced in 3.1.1. Color shall be coast guard red. Application of Inerta and DFT shall be in accordance with the products’ data sheet.
- 3.1.13.** Contractor shall abrasive blast to SSPC-SP-10 Near White Metal, the 3 meter radius around the six areas of the impressed current anodes. All ten anodes will be replaced as part of the ICPP spec item. Fit wooden elliptical blanks 1/8” thick and bolt in place in the recess. This will act as a mask while applying the first layer of Inerta. Protect studs with rubber tubing. This area shall be coated with Intershield 163 Inerta 160 system at DFT 6mm and taper to 3mm DFT at the 3 meter periphery. Remove the blanks and apply Intergard 822 Epoxy Filler at 6mm DFT to the back and edges of the anode recess. The anodes shall be set in the epoxy. The anode faces shall be taped for protection. The Intershield 163 Inerta 160 shall be applied after this coating to the resin holder of the anode (not the metal surface) and approximately 10” into the existing Inerta shield area.. Refer to attached document for Elliptical Anode Area Prep details.

- 3.1.14. Sea-bay grids shall be protected during application of the coating and orifices shall be proven original diameter before undocking. The transducers shall be protected as well. The Contractor shall remove from the ship all traces of grit and air blown debris resulting from the grit blasting operation. Areas to be cleaned on a daily basis include passageways from gangways to entranceways into ship to prevent tracking of the blast debris into the ship.
- 3.1.15. The Contractor shall be responsible for ensuring that personnel engaged in preparing and applying the paint are experienced and thoroughly familiar with the necessary procedures involved.
- 3.1.16. All staging, crange, screens, heaters, enclosures and environmental control equipment, lighting and any other support services, equipment and materials necessary to perform the tasks set out in this specification shall be supplied by the Contractor.
- 3.1.17. Suitable storage facilities for the materials and equipment shall be provided close to the work site. These facilities shall be maintained at a temperature recommended by the paint manufacturer and necessary to ensure ease of preparation and application of paint.
- 3.1.18. Contractor to ensure a backup set of spray equipment is available, to ensure continuous application of paint. No painting is to commence if there is no backup set of spray equipment.
- 3.1.19. All connections to the hull are to be removed in good order (i.e. welding lugs, grounding connections etc.), ground smooth and coated with 2 coats of best quality anti-corrosive paint.
- 3.1.20. Load line and draft marks to be painted on hull on both sides using International Intergard white paint after the anti-friction paint has dried.
- 3.1.21. The contractor shall perform the work in strict accordance with Ameron's application instructions for each applicable coating.

## 3.2 Location

- 3.2.1. Underwater portion of the entire vessel.

## 3.3 Interferences

- 3.3.1 Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### 4.1 Inspection

- 4.1.1. All work shall be completed to the satisfaction of the Chief Engineer.

## **4.2 Testing**

The contractor shall provide DFT readings to the owners representative following each coat at the damaged coating areas. The owners representative shall witness the readings as they are taken. In conjunction with any functional quality assurance procedure, the following points will be carried out:-

- Provide a list of batch numbers with corresponding dates of manufacture.
- Record the quantity and type of any solvent added.
- Measure and record the ambient conditions.
- Record details of spray tips and pressures.
- WFT guage readings to be taken on a regular basis during application.
- Using a calibrated DFT guage, fifteen (15) measurements per 100 square ft. are to be taken and recorded. Upon agreement of consistency with the Chief Engineer, fifteen (15) measurements per 1000 square ft. are to be taken and recorded.
- All recorded information is to be typewritten and three (3) copies are to be given to the Chief Engineer.

## **4.3 Certification**

N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

**5.1.1** The Contractor shall provide a report in electronic format to Chief Engineer of all work performed with this item.

### **5.2 Spares**

N/A

### **5.3 Training**

N/A

### **5.4 Manuals**

N/A

Spec item #: HD-03	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Hull 10 year Survey UT Testing		

## **Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to perform UT testing of the ship's structure as identified in the reference document 2008 Hull Survey UT.
- 1.2 This work shall be carried out in Conjunction with the following:
  - Ballast Tank Maintenance
  - Hull Coating and Inspection

## **Part 2: REFERENCES:**

### **2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. 2008 Hull Survey UT

### **2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

### **2.3 Regulations**

- 2.3.1.

### **2.4 Owner Furnished Equipment**

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** Contractor to arrange for services of NDT technician certified for performing ultrasonic thickness testing by a National accreditation body.
- 3.1.2.** Hull plate thickness is to be determined in 200 positions as directed by Chief Engineer and TCMSB inspector.
- 3.1.3.** Locations and results of all thickness measurements are to be recorded and made available to Chief Engineer
- 3.1.4.** Contractor to provide suitable man lift and operator to facilitate plate thickness determination.
- 3.1.5.** Contractor to quote, separately, hourly cost for additional services of NDT technician, man lift and operator to take additional thickness measurements should this be required.

### **3.2 Location**

- 3.2.1.** Frame 40
- 3.2.2.** Frame 130
- 3.2.3.** Wind and Water Line Hull Plating

### **3.3 Interferences**

- 3.3.1** Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

- 4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer.

### **4.2 Testing**

N/A

### **4.3 Certification**

N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

**5.1.1** The Contractor shall provide a report in electronic format to Chief Engineer of all work performed with this item including UT location and thickness shots.

### **5.2 Spares N/A**

### **5.3 Training N/A**

### **5.4 Manuals N/A**

Spec item #: HD-04	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Hull Butts & Seams		

## **Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to repair wasted areas of welding seams and butts on the underwater portion of the hull.
- 1.2 This work shall be carried out in Conjunction with the following:
  - Underwater Hull Coating
  - Tailshaft Removal
  - Anode Replacement of Impressed Current System
  - Tank Inspections

## **Part 2: REFERENCES:**

### **2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. Shell Expansion Drawing # 07-00-01

### **2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

### **2.3 Regulations**

- 2.3.1. Hull Construction Regulations CSA

### **2.4 Owner Furnished Equipment**

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** Hull plate welding butts and seams shall be inspected and repaired at the time of spec item Hull Survey (HD-03) by TCMSB and the Chief Engineer.
- 3.1.2.** Seams and butts selected for repair shall be marked, cleaned to sound metal by air arc gouging and / or grinding and brought up to the original level by TCMSB approved welding techniques and materials. Contractor shall use welding rods suitable for use with Grade EH-36 modified steel. Contractor shall ensure that last pass or “hard cap” over any welded seam is done using 7018 RCR welding rods. All work shall be performed to the approval of TCMSB and Chief Engineer.
- 3.1.3.** For bidding purposes, Contractor shall include in their bid price the cost of 750 feet of air arc gouging and 2000 bead feet of weld. Contractor shall include a unit cost per foot for air arc gouging and unit cost per bead foot of weld for adjustment purposes. Contractor shall include any staging requirements in quotation.
- 3.1.4.** Butts and seams falling in way of any fuel tanks will require the fuel tank to be gas-freed and certified safe for hot work. Butts and seams falling in way of ballast/void tanks that are painted will require interior paint work to be touched up in way of heat-damaged paint. Cost for gas-freeing will be same as unit cost quoted in spec item Fuel Oil Tank Cleaning and Inspection. Cost for touch up paint shall be same as Ballast tank coating repair.
- 3.1.5.** Contractor shall quote on the services of a man-lift and operator for 8 hours for survey and inspection purposes. Contractor shall quote hourly rate for this work.
- 3.1.6.** All work shall be completed to the approval of the Chief Engineer and TCMSB.

### **3.2 Location**

#### **3.2.1.**

### **3.3 Interferences**

- 3.3.1** Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

- 4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer.

### **4.2 Testing**

N/A

**4.3 Certification**

Welders shall be CWB certified.

**Part 5: DELIVERABLES:**

**5.1 Drawings/Reports**

**5.1.1** The Contractor shall provide a report in electronic format to Chief Engineer of all work performed with this item.

**5.2 Spares**

N/A

**5.3 Training**

N/A

**5.4 Manuals**

N/A

Spec item #: HD-05	<b>SPECIFICATION</b>	TCMSB Field #: N/A
<b>Port Propeller Survey</b>		

## **Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to shall be to open the entire port propeller shaft system for inspection and maintenance. The vessel shall obtain a credit for the survey by TCMSB.
- 1.2 This work shall be carried out in Conjunction with the following:
  - Port Tailshaft, Coupling, and Sterntube Bushing Replacement
  - Underwater Hull Maintenance

## **Part 2: REFERENCES:**

### **2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. LIPS Drwg #A006682
- 2.1.2. The WARTSILA / LIPS contact is:
  - Barry Broderick
  - Wartsila Canada, Mount Pearl, NL
  - LIPS dwg # A1-11582Prop.
  - Diameter: 4800 mm
  - Material: Cunial
  - Mass per blade: approx. 3,500 kg x 4 blades
  - Mass Propeller Hub: 23678 Kg

### **2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

## **2.3 Regulations**

### **2.3.1. Marine Machinery Regulations CSA**

## **2.4 Owner Furnished Equipment**

**2.4.1.** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** Port propeller shall be disassembled for inspection.
- 3.1.2.** The contractor shall allow \$50,000.00 in its bid for the subcontracted services in addition to the cost of the contractor's own work.
- 3.1.3.** The Coast Guard will be retaining the services of the Wartsila FSR for all of the work on this item which shall be carried out in accordance with the recommended manufacturer's instructions and under the direction of the WARTSILA / LIPS Field Service Representative.
- 3.1.4.** Coordination of related spec items shall be at the contractor's discretion, but contractor shall note requirement in, Shaft removal, for blade/hub position shall be at full astern to facilitate shaft removal.
- 3.1.5.** Oil shall be drained from hub and disposed of by Contractor, approximately 1,200 liters of oil in hub assembly.
- 3.1.6.** The procedures listed below are for guidance only since the LIPS Service Representative will determine the correct order for hub disassembly and later assembly.
- 3.1.7.** Blades shall be removed at top dead center (12 o'clock position). Each blade has 9 retaining bolts, 5 forward, 4 aft. Blades bolts are tied together with stainless steel round bar spot welded to the bolt heads. There are 2 lifting points located at the root of each blade. The shaft must be rotated by ship's staff to bring each blade to the TDC position.
- 3.1.8.** Contractor shall prepare & fit rigging (wire & nylon slings, shackles etc) for blade removal at suitable lifting points located over the propellers. Coast Guard will supply the blade lifting rig. Spot-welded stainless steel round bar shall be carefully cut off at welds using a grinder. Contractor shall renew SS round bars.
- 3.1.9.** The Hytorc Tool for Propeller Bolts will be provided by the ship, vice as written.
- 3.1.10.** The pre-tensioned blade bolts shall be released under the direction of the LIPS service representative using ship supplied HY-TORC equipment. Bolt release HY-TORC pressures shall be recorded. Bolts shall be marked before withdrawal. Each blade shall be marked to return to original location on hub. Blade bolts shall be moved to a safe location for stowage, ensuring threads are suitably protected.

- 3.1.11.** Fit lifting eyes to blade and connect to rigging such that blade is lifted evenly from hub. Extra care must be taken to ensure there is no damage to the blade housing on the hub assembly. Removed blade shall be moved to a suitably clean and sheltered area so that the blade is protected from any possible damage. Repeat for remaining 3 blades.
- 3.1.12.** The contractor shall allow \$20,000 in its bid for the subcontracted services of blade repair. The Contractor shall include the shipping costs in the cost of its own work.
- 3.1.13.** The Contractor shall arrange for a blade repair specialist to carry out the following work on all four of the port blades. Blades shall be sent to contractor's facility. Edges shall be dressed and cleaned and the blades measured. All porous areas shall be cleaned and filled with Devcon Bronze Putty and refinished smooth. Blades shall be balanced. Type written copy of the blade repair shall be given to the Chief Engineer.
- 3.1.14.** Hub cover shall be removed. The propeller hub shall be removed and transported to the shop for disassembly.
- 3.1.15.** Sliding piston yoke and blade carriers shall be removed. Due care and attention shall be taken with disconnection of internal piping from yoke. Emergency piston shall be removed from tailshaft and shall be cleaned and inspected.
- 3.1.16.** All parts shall be inspected. Sliding blocks, yoke pins and blade carrier slots shall all be measured and sliding block clearances determined.
- 3.1.17.** Open hub and all associated components shall be adequately wrapped and protected while disassembled. Contractor shall be responsible for ensuring that no foreign material of any sort accesses hub internals.
- 3.1.18.** The hub shall be measured in areas directed by the FSR.
- 3.1.19.** The hub assembly shall be reassembled with new, owner supplied (GSM) seals, Inner pipe shall be reconnected to yoke.
- 3.1.20.** The 4 propeller blades shall be fitted with new CCG (GSM) supplied o-rings and shall be reinstalled. All blade surfaces shall be thoroughly cleaned of all dirt or debris.
- 3.1.21.** Before lifting each marked blade to the appropriate location, the blade flange and mating surfaces shall be checked for any damage. Apply grease as required.
- 3.1.22.** Lower each blade into position taking extra care to avoid damage to the sealing and mating surfaces. Prior to the final lowering of the blade, ensure the hub assembly is completely free of dirt etc.
- 3.1.23.** Position the blade over the hub blade housing and line up vertically and laterally. Line up the blade retaining bolt holes on the blade with the corresponding holes in the hub.
- 3.1.24.** Lower the blade in place until the locating pins in the hub assembly have engaged in holes in the blade flange. As soon as the blade flange is engaged in the hub assembly, fit 2 bolts: one on the forward side, one on the aft side and engage threads. This will ensure the blade is in the correct position.
- 3.1.25.** Lower the blade all the way down to the final position and screw down on the 2 bolts by hand. Fit all the remaining bolts and hand tighten.

- 3.1.26. Position and fit the hydraulic HY-TORC pump and sockets. Tighten bolts as per LIPS specifications and in rotation as required. Shaft shall be rotated to fit the 3 remaining blades in original locations.
- 3.1.27. Upon completion of the bolt and blade installation, Contractor shall spot weld in place stainless steel locking bar as per original installation.
- 3.1.28. Hub shall be refilled with approx 1,200 liters of Harmony AW 68 (CFM). All hub plugs shall be reinstalled and locked in position.
- 3.1.29. Contractor shall supply the material and fabricate four (4) naval bronze plugs as per supplied sample. Plugs shall be installed where missing in the lifting eye hole on the forward side of the blades one bronze plug each complete with neoprene gasket of suitable thickness. Loctite PST 565-31 shall be used on the threads. Contractor shall quote on the installation of one plug. The exact number required will be determined when the vessel is docked and will be adjusted by 1379 action.
- 3.1.30. All work shall be completed to the satisfaction of the Chief Engineer and TCMSB.

### **3.2 Location**

#### **3.2.1.**

### **3.3 Interferences**

- 3.3.1 Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

- 4.1.1. All work shall be completed to the satisfaction of the Chief Engineer, Wartsila Field Service Rep, and TCMSB Inspector.

### **4.2 Testing**

Testing on system to be completed to the satisfaction of Wartsila FSR, TCMS, Chief Engineer and also during dock & sea trials.

### **4.3 Certification**

N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

**5.1.1** The Contractor shall provide a report in electronic format to Chief Engineer of all work performed with this item.

**5.2 Spares**  
N/A

**5.3 Training**  
N/A

**5.4 Manuals**  
N/A

Spec item #: HD-06	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Port Tail Shaft Replacement and Survey		

## **Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to replace the port tailshaft, SKF coupling, and stern tube bushings with new CCG supplied equipment. Obtain a survey credit from TCMSB.
- 1.2 This work shall be carried out in Conjunction with the following:
  - Port Propeller Blades and Hub Survey
  - Port Shaft System Alignment

## **Part 2: REFERENCES:**

### **2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. Contact : Wartsila Canada, Barry Broderick
- 2.1.2. The following weights are applicable:

Propeller + shaft flange + oil	= 38500 KG
Propeller shaft + pipes + oil	= 46765 KG
Length of tail shaft to forward end of hub	= 13.94 meters
SKF coupling & ring nut	= 2240 KG
- 2.1.3. LIPS Arrangement Of Shafting Drawing # A006759
- 2.1.4. Wartsila Type MA Seal Assembly Drawing # H30850-01
- 2.1.5. Oil Type: Petro Canada Hydrex AW 68
- 2.1.6. Oil Capacity 1200 liters
- 2.1.7. Wartsila Water Lubricated Bearing Manual DPM-01

### **2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

## **2.3 Regulations**

### **2.3.1.**

## **2.4 Owner Furnished Equipment**

**2.4.1.** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** Due to the importance and sensitivity of the equipment in this specification item, the Contractor shall ensure that grit / sand blasting operations are not carried out in the dry dock for the duration of this specification item.
- 3.1.2.** The contractor shall obtain the services of the Wartsila/LIPS Field Service Rep to supervise the work specified in this specification. Allow \$40,000.00 for the services of the representative and adjust the final cost by 1379 action.
- 3.1.3.** The qualified service representative shall be in attendance at all times when this work is being carried out. The procedure listed below shall be used as a guideline only. Contractor and the service representative will co-ordinate activities to ensure the tail shaft is safely removed and installed on completion. Manuals for use of hydraulic tools are available from the Chief Engineer.

#### **Tailshaft Weardown**

- 3.1.4.** Clearances at aft port tail shaft bearings, shall be taken with feeler gauges at 90° intervals around shaft and recorded after the new shaft is installed with new sterntube bearings.
- 3.1.5.** Clearances and poker gage readings shall be taken with the Chief Engineer's designate in attendance. Staging costs shall be included in Contractor's quotation.
- 3.1.6.** Wear down of shaft bearings shall be determined by means of poker gages. Poker gages for measuring wear down are held onboard the ship and will be made available to the contractor.
- 3.1.7.** Poker and feeler gauge readings shall be recorded with 3 typewritten copies passed to the Chief Engineer within three days.

#### **Disassembly:**

- 3.1.8.** Ensure propeller pitch is left in full astern position for later disconnection of inner oil pipe.
- 3.1.9.** Open by-pass valve on CPP system header tank to drain tank.

**3.1.10.** Contactor shall supply and install suitable welded lifting lugs on the ship's hull as required to carry out this work. Lifting eye pads located on the ship's hull are not to be used. On completion of all work, lifting lugs shall be air arc gouged off, areas to be ground smooth and painted as per underwater hull coating system.

### **Rope Guard**

**3.1.11.** Port rope guard shall be removed in half sections and lowered to dock floor.

**3.1.12.** Contactor shall use air-gouging equipment to remove circumferential and butt welds to minimize damage to rope guard landing faces and damage to Thordon stern tube bushings. Contactor must install a fire blanket barrier inside the rope guard up against the aft end of the Thordon bushings to prevent slag from damaging the Thordon.

**3.1.13.** After rope guard has been removed, Contactor shall grind off weld slag and spatter debris on stern tube castings and rope guard landing faces.

**3.1.14.** Contactor shall quote on the supply and installation of 25 feet of stainless steel locking wire to replace missing or damaged lock wire on stern tube retaining bolts.

**3.1.15.** To install rope guard, use E 8018 –C1 electrodes and ensure preheat and interpass temperatures in the range of 140°C to 204°C can be maintained during the welding operations. Contactor shall ensure a 10 mm to 15 mm gap is kept between the propeller forward face and the rope guard aft edge. 12 mm continuous fillet welds to be used around rope guard circumference to shaft bracket casting. Butts shall be continuous weld.

**3.1.16.** Rope guard shall be grit blasted both sides and both sides painted as per painting specification for underwater hull. After installation, welded area paint shall be touched up.

### **Mud Room Deck Removal**

**3.1.17.** The deck in the lower mud room above the port sterntube seal shall be cut out to allow removal and installation of the shaft seal, SKF Coupling, and sterntube bushings. Contactor shall consult with TCMSB before removal takes place. The opening shall be as large as possible without disturbing deep frames and adjacent bulkheads.

### **Inner Shaft Seal**

**3.1.18.** Contactor shall remove the port stern tube inboard seals and inflatable tire and install new owner supplied seals and tire (GSM). The MA seal is a fully split face type seal. Wartsila service representative shall be in attendance at all times when this work is being carried out. The procedure listed below shall be used as a guideline only. Contactor and the service representative will co-ordinate activities to ensure correct installation of parts.

**3.1.19.** The stern tube seal is a Wartsila UK, 840 MOD 800 Type MA Seal. A manual for stern tube seal is available from the Chief Engineer.

- 3.1.20.** Stern tube cooling water piping and seal cooling water piping shall be removed and stored as required.
- 3.1.21. Isolation:** Close the valve supplying water to the sterntube bearing and main seal and operate the inflatable seal. Open the drain on the main seal and drain off any remaining fluid.
- 3.1.22. Seal Compression:** Screw the compression tools to the main clamp ring screws and fit studding into the slots. Lock the studding in position on the forward most tool with nuts either side. Compress the seal evenly and progressively so that a gap of 5mm maximum exists between face and seat. Do not over compress seal as this will result in damage to bellows assembly.
- 3.1.23. Splash Guard removal:** Undo or unclip the splash guard from around the Carrier-retain for reuse if not being renewed.
- 3.1.24. Drive Clamp Ring Removal:** Slacken the locking nuts on the Drive and adjusting screws, and then undo the screws until they are clear of the seat. Slacken, then undo the Drive Clamp Ring Butt screws and carefully remove the Drive Clamp Ring from the shaft.
- 3.1.25. Seat Removal:** If possible turn the shaft on the turning gear so that the seal butts are horizontal. Loosen the seat butt screws and pull the seat forward clear of the face and secure lifting equipment to the top half. Remove the butt screws, separate the butts and lower the bottom half clear of the shaft. Remove and retain the seat dowels and spring pins for future use. Secure lifting equipment to the top half and lift it clear of the shaft. Remove and discard the two O' cords. In order to best protect the Seat, especially the butt surfaces, it is recommended that once removed from the shaft, the seat is joine back together using the dowels/spring pins and butt screws.
- 3.1.26. Face Removal:** Insert a lever into the gap between face and carrier, gently lever working around the circumference until the face begins to move. Note: Do not use excessive force or the face will be damaged. Fully remove both halves of the face, remove and discard the sealing strip.
- 3.1.27. Backing Spring Removal:** At this stage remove the compression tooling allowing the bellows to expand to its natural free length. Support the carrier with wooden blocks chocks and loosen the main clamp ring screws. Remove the screws from one segment at a time and carefully ease the main clamp rings and backing springs away from the seal. Remove the short bridging springs. Care should be taken when removing backing and bridging springs if they are to be reused.
- 3.1.28. Interlayer:** Remove the PVC tape from the interlayer and starting at the loose end unwind interlayer. This item must always be renewed on rebuilding the seal.
- 3.1.29. Support Spring Removal:** First remove any PVC tape from around the support spring. The support spring assembly is connected by O'cords. Find the ends of the assembly and gently pull so that the springs unclip from the slots in the carrier and mounting ring. Note: care should be taken if the support spring assembly is to be reused.

**3.1.30. Carrier and Mounting Ring Removal:** With the MA seal, at this stage of seal dismantling, only the Carrier and Mounting rings will be left fitted around the shaft. If necessary to remove them, do the following: **Carrier Removal:** Remove the two bronze dowels from the 2 butts of the carrier and retain for re-use. Sling both halves of the carrier to a suitable lifting arrangement using nylon straps. If necessary arrange the carrier so that its butt joint is horizontal and slacken the butt screws sufficiently to create room for the fitting of a strap. With both halves of the carrier secured, remove the internal and external butt securing screws and carefully separate both halves and remove them from the shaft. Ensure that, the butt surfaces are not damaged in this procedures and that the face anti-rotation pins remain in place. **Mounting Ring Removal:** To remove the mounting ring, the vessel must be out of the water and all services (air and Water) must be disconnected from the Mounting Ring. Remove and retain the Al-Bronze Dowels joining the two halves as for carrier. Remove the nuts or screws securing the mounting ring to the sterntube. Separate the mounting ring from the sterntube joint. (The mounting ring has four off tapped through holes for fitting the compression tooling-jacking screws may be inserted in these holes to assist in the removal from the sterntube.) Secure and sling both halves of the mounting ring with straps as for the carrier. Undo and remove the Inflatable Seal Adapter ring screws from the back of the mounting ring followed by the split ring itself. Carefully ease the Inflatable seal and its Support ring out of the recess in the back of the mounting ring, then remove the split support ring and cut and discard the old inflatable seal. Remove the butt securing screws and carefully separate the two halves of the mounting ring and remove it from the shaft.

**3.1.31. Refurbishment:**

- Face Insert – not refurbishable-replace.
- Seat – refurbishable by machining.
- Bellows Assembly – not refurbishable – reuse or replace if required.
- Elastomers – not refurbishable – replace when disturbed.

**3.1.32. Seat Refurbishment Procedure:** Whenever the seat is dismantled or a new face insert is to be fitted, the running surface of the seat shall be machined to remove the wear track. Re-machining can only be carried out with the two halves secured together. Carefully remove butt screws, retain with seat dowels and spring pins for future use. Thoroughly clean two halves, especially all machined surfaces and the butt surfaces to remove traces of sealing compound. Place each half of the seat, butts down on a clean surface table. Using a feeler gauge check for flatness by ensuring that a gap of no greater than 0.025mm exists. Alternatively, if suitable surface tables is not available, bolt the two halves together clean and dry and check the gap is not in excess of 0.05mm. Once the butts have been found to be satisfactory, the seat dowels and spring pins can be refitted and the halves of the seat carefully reassembled without butt sealant. Ensure the screws are torqued. Seat can now be machined when aligned vertically and horizontally. Machine to 1.6um finish and polish to final finish of 1.2um with 600 grit paper.

**3.1.33. Remove Split Seal Liner:** With the seal removed from the shaft remove the split liner. This will not be reused as the new shaft has the bronze liner extended to replace the split liner.

- 3.1.34. Seal Reassembly Procedure:** Assemble the seal and install it as a unit as per section 7.2 of the manual or in the reverse order of disassembly. All elastomer, gaskets, and face inserts shall be replaced with CCG supply new parts.
- 3.1.35.** The above procedures are a guide for bidding purposes.
- 3.1.36.** The inflatable seal shall be pressure tested as per Wartsila protocol. The shaft seal shall be hydro-tested as per Wartsila protocol. The runout of the seat shall be witnessed by CCG representative.
- 3.1.37.** All piping attachments for stern tube cooling and seal cooling shall be assembled using new gaskets (CFM), o-rings etc where applicable.
- 3.1.38.** Cooling water systems shall be pressure tested and proven tight.
- 3.1.39.** Contractor shall submit report three (3) type written copies to Chief Engineer on all run-out readings and clearance measurements at 90 degree intervals for work carried out on stern tube seals.

**Disassembly Cont'd**

- 3.1.40.** Area in way of the stern tube seal shall be cleaned of dirt, rust and debris before moving the shaft.
- 3.1.41.** If required, ship staff will rotate shaft to allow for hydraulic connections can be made to SKF coupling. Sections of stern tube cooling water piping and shaft seal water piping may be removed and stowed by Contractor if required. Coast Guard (GSM) shall supply hydraulic pump unit for coupling removals.
- 3.1.42.** To remove the MORGRIP bolts, shaft can be rotated and small port-a-pack jacks can be used with the strong-back to ease out the MORGRIP bolts. Flanges and MORGRIP bolts shall be marked as to their original locations and the bolts taken to the Contractor's machine shop for polishing and dressing of threads. Contractor shall include in quotation the cost of chasing the threads on four (4) MORGRIP bolts. Coupling and intermediate shaft flange bolt holes shall be dressed to remove scale and burrs.
- 3.1.43.** The SKF coupling shall be removed from the shaft tunnel and placed in the mud room. The new SKF coupling shall have the bolt hole bores measured and compared to the measurements of the intermediate shaft bolt hole bores. The bolt holes bores shall be reamed on either the coupling or the intermediate shaft to have matching bore measurements. Morgrip coupling bolts shall be identified, removed and stored in a safe location. The contractor shall allow \$20,000.00 for supplying 12 new morgrip bolts if required. Final machining of Morgrip bolts will be covered by 1379. Morgrip bolts shall be cleaned up, bolt diameters and borehole diameters measured and recorded. Three (3) typewritten copies of readings shall be given to Chief Engineer.
- 3.1.44.** Tail shaft shall be pushed aft a distance of 320 mm using jacks at propeller hub.
- 3.1.45.** Disconnect inner oil pipe, and store flange bolts.
- 3.1.46.** Tailshaft shall be moved another 200 mm aft.

- 3.1.47.** Shaft and coupling location shall be marked at aft end of coupling before pumping coupling off shaft. SKF coupling shall now be pumped off using SKF pump equipment. Contractor shall ensure during removal that coupling is properly supported and does not damage tapered area of shaft. Shaft and coupling tapered sections (including keys & keyways) shall be thoroughly cleaned. A qualified NDT technician to carry out magna-flux testing for cracks on tapered areas of shaft and coupling as directed by Chief Engineer. Three (3) typewritten copies of the testing report to be given to Chief Engineer.
- 3.1.48.** Tailshaft can now be withdrawn by Contractor using care and shall withdraw tailshaft and not damage the rubber coating between bronze liners. Forward end of the tail shaft will be required to be supported by a wood block during this procedure. Six hardwood saddles shall be fabricated to suit the radius of the shaft and stern tube. During removal Contractor shall use suitable rated nylon slings for moving and lifting of tailshaft. Also to note, ship does not have a hub lifting plate.
- 3.1.49.** Tailshaft shall be fully supported on both bronze liners on Contractor supplied cradle and situated within a protected enclosure to allow for inspection of the rubber coating.
- 3.1.50.** As the shaft is being replaced with a new shaft, the inner oil pipes shall be withdrawn from the shaft and laid aside on supported cradles to prevent bending. The pipes shall be covered with protective material to prevent ingress dirt, water etc. The old shaft shall be coated with a protective coating and wrapped to protect from corrosion and ingress of dirt. The shaft shall be removed from the dock bottom and laid aside on supported cradles until further direction from the owner on where the shaft is being delivered. The inner pipes shall be removed from the dock bottom and placed in the shipyard shop. The pipes shall be disassembled to replace the joint seals at all connections. The pipes shall be reassembled with new seals and flushed through a suitable filtering system with new oil.
- 3.1.51.** The new shaft shall be lowered to the dock bottom and placed on supported cradles for preparations to be installed.
- 3.1.52.** If grit blasting or painting operations are carried out while tailshaft is out of ship, Contractor shall supply and install protective covering over the tailshaft and ensure the stern tube is blanked off.
- 3.1.53.** The forward and aft bronze tailshaft liner diameters of the new shaft shall be measured and recorded on Wartsila service sheets. The measurements shall be taken at four equal distance position over the length of each liner and measured in the port/starboard and forward/aft directions. Three (3) type written copies shall be given to the Chief Engineer.

**Stern tube Bushings:**

- 3.1.54.** The six stern tube bushings shall be replaced with new Wartsila UK bushings. Remove the outer compression ring and the inner connecting ring to allow access to the stern tube bushings. The inner connecting ring shall be lifted to the mud room and laid aside. The bushings shall be removed from the stern tube.

- 3.1.55.** The existing bushing carriers shall be measured internally at several locations over the length, vertically and horizontally positions for the forward and aft carriers.
- 3.1.56.** The new Wartsila bushings require an anti-rotation key to be fitted to each carrier over the entire length of each carrier. The length of the aft carrier is 3404mm and the forward carrier is 1500mm. The exact dimensions of the key shall be determined on site, allow 50mm wide x 30mm thick for bidding purposes. The key shall be of bronze material. The key shall be fitted top dead center of the carriers and maintain an alignment within  $\pm 0.5$ mm forward and aft. The key shall have a radius on one side to match the radius of the carrier ID. The carriers shall be drilled and tapped to form blind holes for 16mm x 35mm cap screws. Holes shall be spaced 90mm on center with the end holes been 45mm from the end of the carriers. The key shall be drilled and counter bored to recess the cap screws. The cap screws shall be fitted with Duro-Nylon washers and have a locking arrangement along with thread Loctite. The key shall be machined to final dimension advised by the Wartsila representative.
- 3.1.57.** From the carrier measurements and calculations, the new bushings OD shall be machined to final dimensions and installed in the sterntube bearing carriers. The bushings will require freeze fitting to allow installation. Measurements from the tailshaft liners shall be used to determine the final ID of the bushings. Installation and machining of sterntube bushing shall be in accordance with procedures specified in the Manual DPM-01. Final inside diameter measurements shall be taken at four equal distance positions over the length of the forward and aft bushings and measured in the port/starboard and forward/aft directions. Three type written copies shall be given to the Chief Engineer.
- 3.1.58.** The forward and aft securing rings shall be reinstalled with new orings.
- 3.1.59.** All parts and sealing surfaces shall be thoroughly cleaned before reassembly to ensure tight seals.
- 3.1.60.** The circumferential area in the stern tube (approximately 5.6 m long x 0.92 m dia) between the forward and aft bushings shall be thoroughly grit blasted clean to remove loose scale, paint etc. and provide the required surface profile for the application of the Devcon ceramic. All debris shall be cleaned from stern tube. Before application of compound, all surfaces must be clean, dry and free of all contaminants including salt deposits.
- 3.1.61.** The cleaned steel surfaces inside the stern tube shall be fresh water washed to remove salt deposits from the steel. Bare steel shall be thoroughly dried and wire brushed to clean of any flash rusting. Complete steel area shall be surface roughened by grit blasting to remove rust blisters and to increase the adhesion ability of the steel.
- 3.1.62.** All holes and pitted areas larger than 1/4" depth x 1/4" dia shall be grit blasted to good metal. All prepared holes and pitted areas shall be filled with DEVCON CERAMIC PUTTY REPAIR (CFM). Contractor shall quote of supplying and applying 25 KG of putty material.

- 3.1.63.** After the putty has cured, one coat of DEVCON BRUSHABLE CERAMIC WHITE shall be applied over the entire bare steel area. Before the White Ceramic has fully cured and following the DEVCON technical data sheet the entire circumferential area of the stern tube shall be coated with Brushable Ceramic Blue (Contrasting colour). Contractor shall quote on supplying and applying 50 KG of material.
- 3.1.64.** Contractor shall apply all coatings as per the manufacturer's technical data sheets and supply sufficient ventilation and any heat required to allow for complete curing of coatings.

**Assembly:**

- 3.1.65.** The new SKF coupling shall be lowered to the shaft tunnel and supported by nylon slings and wooden blocks.
- 3.1.66.** The forward and aft stern tube bearings shall be lubricated with liquid soap (CFM), and applied sufficiently to provide lubrication during shaft installation. All tailshaft bearing surfaces shall be wiped completely clean of any dirt, sand etc. before tailshaft is installed. No grit blasting or painting operations shall be carried out until tail shaft installation is completed. Tapered end of tailshaft and SKF coupling bore shall be dressed to remove any rough material.
- 3.1.67.** Tailshaft shall be installed in good order. Care shall be used to ensure shaft is correctly aligned with stern tube and shaft coating and stern tube bushings are not damaged during this operation. Wood block shall be used on forward end to guide shaft along stern tube. When shaft is close to entering forward bushing, a small jack is used to center the shaft. Care shall be taken not to damage ceramic coating.
- 3.1.68.** The shaft can be pushed into the coupling leaving 700 mm to the intermediate shaft flange.
- 3.1.69.** See installation of Sterntube Seal.
- 3.1.70.** The coupling can now be pumped onto the old mark on the shaft. Pumping on should be done in increments of no more than 10 mm to avoid damage to the coupling seal. SKF coupling shall be moved up a total of 44.5 mm. Lubricate nut well with anti-seize. Screw on hand tight and put dowel pin in place.
- 3.1.71.** Move shaft with coupling until 300 mm remains between intermediate shaft and coupling flange.
- 3.1.72.** Connect inner oil pipe flanges using loctite on fasteners.
- 3.1.73.** Push shaft into place, ensuring bolt holes are aligned. Install MORGRIP bolts as per supplied instructions. Do not exceed maximum pressure on pump.
- 3.1.74.** The shaft sleeve is now positioned and fastened. Maximum run out should be no more than 0.2 mm.
- 3.1.75.** The shaft shall be rotated by ship's staff to position the vent & drain holes on the propeller hub to the 12 o'clock and 6 o'clock positions respectively.
- 3.1.76.** The CPP system shall be filled with the appropriate oil. The propeller hub vent plug shall be removed. Header tank by pass valve shall be closed. One CPP pump is required with occasional activation of ahead and astern movement from the MCR. NOTE: LIPS service representative to ensure the blades are '0' (zero) pitched before undocking.

- 3.1.77. Ship's staff will assist in this operation, which takes 7 to 8 hours to complete.  
When oil has reached the top of the vent hole, the vent plug shall be installed.
- 3.1.78. System shall be bled of all air from within hub.
- 3.1.79. System pumps shall be run up and blades moved to ensure free operation.
- 3.1.80. All removed piping in shaft tunnel shall be installed and pressure tested.
- 3.1.81. See Port Rope Guard installation.
- 3.1.82. Contractor to include in cost the fitting and removal of any welded lugs required to carry out this work. On completion of this work and before dry dock is flooded, all lug welds shall be ground flush and painted with AMERCOAT as per under water hull coating spec.
- 3.1.83. All tools provided by CCG shall be cleaned and returned to storage areas and secured under the supervision of Chief Engineer's designate.
- 3.1.84. The completed installation shall be functionally tested during sea trials.

## 3.2 Location

- 3.2.1. Shaft Tunnel Port Side

## 3.3 Interferences

- 3.3.1 Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## Part 4: PROOF OF PERFORMANCE:

### 4.2 Inspection

- 4.1.3. All work shall be completed to the satisfaction of the Wartsila FSR, Chief Engineer & TCMS.
- 4.1.4. TCMSB shall inspect all disassembled parts.

### 4.2 Testing

Testing shall be completed to the satisfaction of the Wartsila FSR, TCMS and Chief Engineer and again during Dock & Sea Trials.

### 4.3 Certification

N/A

## Part 5: DELIVERABLES:

### 5.1 Drawings/Reports

5.1.1 Wartsila Canada shall provide a written report consisting of observations, defects, repairs, recommendations, and measurements to the Chief Engineer.

**5.1.2** Contractor shall provide records of measurements in type written electronic form to the Chief Engineer

**5.2 Spares**  
N/A

**5.3 Training**  
N/A

**5.4 Manuals**  
N/A

Spec item #: HD-07	<b>SPECIFICATION</b>	TCMSB Field #: N/A
<b>Seabays Maintenance</b>		

## **Part 1: SCOPE:**

- 1.1** The intent of this specification shall be to open the suction and discharge sea bays for cleaning, painting, TCMSB inspection and the installation of anodes. Contractor shall ensure marine chemist certificates for these areas for confined space entry and hot-work are obtained and kept valid as per the General & Safety Notes.
- 1.2** This work shall be carried out in Conjunction with the following:
- Sea Valve Maintenance
  - Central Cooling and Seawater Valve replacement
  - Seawater Impressed current anode system
  - Bubbler Piping Inspection

## **Part 2: REFERENCES:**

### **2.1 Guidance Drawings/Nameplate Data**

- 2.1.1.** Tank Capacity Plan Drawing # T13 1027
- 2.1.2.** Suction Sea Bay Volume 45 m<sup>3</sup>, Area 210 m<sup>2</sup>
- 2.1.3.** Discharge Sea Bay Volume 44 m<sup>3</sup>, Area 200 m<sup>2</sup>

### **2.2 Standards**

- 2.2.1.** The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2.** Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3.** Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4.** Coast Guard ISM Hotwork procedures
- 2.2.5.** Coast Guard ISM Fall Protection procedures
- 2.2.6.** Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7.** CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8.** SSPC-SPT

### **2.3 Regulations**

- 2.3.1.**

## **2.4 Owner Furnished Equipment**

- 2.4.1.** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** There is 1 docking plug each for the suction and discharge sea bays. The docking plugs shall be removed to drain water from the sea bays during the work. On completion of all work, docking plugs shall have threads dressed and coated with white lead. Thread Tap shall be run through holes and docking plugs installed in good order.
- 3.1.2.** Access to the suction and discharge sea bays is by removal of tank top manhole covers located to the starboard side of the Lower Forward Machinery Compartment, suction sea bay cover Frame 99 – 102, Discharge Sea bay cover Frame 102 – 105.
- 3.1.3.** The Seabays shall be gas freed for entry and hotwork and certified by Marine Chemists. The spaces shall be certified gas free during the entire period of the work description.
- 3.1.4.** All internal surfaces of the forward and after sea bays shall be cleaned of all loose rust, dirt, debris and marine growth by means of high pressure fresh water wash.
- 3.1.5.** Contractor shall be remove all debris and dispose of ashore. After cleaning is completed, Contractor shall arrange for inspection with Chief Engineer and TCMSB prior to mechanical cleaning and painting.
- 3.1.6.** IMPORTANT: The forward bulkhead in the discharge sea-bay at frame 105 and the aft bulkhead in the suction sea-bay at frame 99 are contiguous with tanks containing fuel / lubricating oils. CONTRACTOR SHALL ENSURE THERE IS NO BURNING OR WELDING CARRIED OUT ON THESE BULKHEADS. CONTRACTOR SHALL ADVISE ALL WORKERS IN THIS AREA OF THE POTENTIAL HAZARDOUS SITUATION.
- 3.1.7.** Contractor shall quote on renewing 20 sacrificial anodes in each sea bay and replacing with 20 x 10 lb anodes per sea bay, total of 40 anodes required. Contractor shall quote a unit cost per anode for adjustment purposes. Old anodes shall be removed before cleaning and painting. New anodes (CFM) shall be spot welded in place after paint has cured.
- 3.1.8.** Contractor shall mechanically clean 80 square meters in each of the two seabay internals to SSPC-SP3 or hand-tool clean SSPC-SP2. Before paint application, all surfaces shall be clean, dry and free of all contaminants including salt deposits. Surface preparation and paint application shall be to manufacturer's recommendations. All debris shall be removed prior to painting. A separate quote for unit cost per square meter for paint and preparation shall be included and adjusted by PWGSC 1379 action if different from the 80 square meters.

- 3.1.9. Sea-bay internals and applicable surface areas shall be stripe coated before painting to ensure all hard to reach areas are coated. After striping, sea-bay internals shall be given 2 coats of Amerlock 2 of contrasting colours, with the final coat a light colour. Each coat shall be 5 to 8 mil D.F.T.
- 3.1.10. Contractor shall supply all ventilation to ensure the complete drying of the first and second coats and also to protect against condensation and humidity.
- 3.1.11. On completion of all work, sea bays shall be inspected by Chief Engineer prior to closing up. Manhole covers shall be securely refitted after final inspection. Contractor shall supply and fit new ¼” neoprene gaskets (CFM) on all manhole covers and apply anti-seize compound to all securing studs.
- 3.1.12. All ventilation equipment and materials required to carry out above work shall be provided by the Contractor.
- 3.1.13. Bilge area at tank top level in these areas shall be left in “an as clean as found” condition on completion of the work.

### **3.2 Location**

- 3.2.1. Suction Sea Bay Frame 99 – 102, Double Bottom
- 3.2.2. Discharge Sea Bay Frame 102 – 105, Double Bottom

### **3.3 Interferences**

- 3.3.1 Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

- 4.1.1. All work shall be completed to the satisfaction of the Chief Engineer.
- 4.1.2. TCMSB Hull surveyor shall inspect the spaces before coatings are applied.

### **4.2 Testing**

N/A

### **4.3 Certification**

N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

- 5.1.1 The Contractor shall provide a report in electronic format to Chief Engineer of all work performed with this item.

**5.2 Spares**  
N/A

**5.3 Training**  
N/A

**5.4 Manuals**  
N/A

Spec item #: HD-08	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Rudder & Stock Survey		

## **Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to remove rudder and rudder stock for inspection, measurement, and to obtain a survey credit from TCMSB. Rudder and stock shall be unshipped for full inspection. Rudder pintle bushings shall be measured. Contractor shall perform and record Rudder Bump Clearances prior to disassembly. All components shall be cleaned and inspected, dimensions and clearances of all working parts shall be recorded.
- 1.2 This work shall be carried out in Conjunction with the following:

## **Part 2: REFERENCES:**

### **2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. Wagner Carrier Radial Bearing General arrangement Drawing # D2388
- 2.1.2. Burrard Yarrows Drawing #26.01.03 – Rudder Stock
- 2.1.3. Burrard Yarrows Drawing #26.01.01 – Rudder

### **2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

### **2.3 Regulations**

- 2.3.1. Marine Machinery Regulations CSA

### **2.4 Owner Furnished Equipment**

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

### **Part 3: TECHNICAL DESCRIPTION:**

#### **3.1 General**

- 3.1.1. Contractor to remove the upper and lower fair water plates. Note the lower fairing plate consists of 2 semi portable plates and 1 fixed plate in the center. Care shall be taken when removing the plates since the plates will be re-used at the completion of the job. Plates shall be marked as they are removed to ensure the plates are returned to original location.
- 3.1.2. Pintles and gudgeons shall be high pressure water washed (3000 to 5000 psi) to remove any accumulated marine growth.
- 3.1.3. Rudder vent and drain plugs shall be removed and any accumulated water drained. Plugs shall be installed in good order. Contractor shall obtain a gas-free certificate. Note: rudder shall be turned a few degrees off centerline for access to top vent plug. Contractor shall advise Chief Engineer when this work shall be undertaken in order that ship's staff can turn rudder and witness plug removals. Contractor shall provide an air test (2 psi) for ½ hour in presence of Chief Engineer. Contractor shall apply white lead or equivalent to threaded sections.
- 3.1.4. The three bearing pads between the rudder pintle boss and stern frame shall be inspected for wear and / or damage. Clearance between bearing pads and rudder shall be measured and recorded. The bearing pads are in the form of an arc.
- 3.1.5. Eight (8) rudder palm bolts, nuts and protective covers shall be checked for defects and / or damage.

#### **Rudder Removal:**

- 3.1.6. Rudder shall be placed hard over to starboard.
- 3.1.7. Lifting gear shall be fitted to the tiller head that is capable of lifting and supporting the tiller head, rudder stock.
- 3.1.8. Contractor shall remove the upper pintle protective cover. Contractor shall ensure that care is used when removing the tack welds, since the cover will be re-used. Note: cover is filled with tallow. Remove pintle locking key and note locking key shall be re-used.
- 3.1.9. Three (3) pintle nuts shall be removed and serviced before removing the pintles. New Owner supplied tires (GSM) shall be fitted and the nuts checked for leaks after servicing. A copy of the service manual will be provided.
- 3.1.10. Remove protective covers on eight (8) Morgrip bolts (palm bolts). Clean off debris & waterproofing off the threads and bolt barrel. Palm bolts shall be marked to "as fitted" location. Note: Covers shall be re-used. New seal rings (CFM) shall be fitted.
- 3.1.11. Using the pad on the rudder stock, the upper pintle tension shall be released before releasing the palm bolts.

- 3.1.12.** Release and remove eight (8) palm bolts, raise rudder stock to clear the key and move stock to hard to port.
- 3.1.13.** Rig lifting equipment shall be capable of lifting the rudder. The estimated weight of the rudder is 25 tonnes.
- 3.1.14.** Contractor shall mark the location of each pintle. Remove pintle locking key on the middle and lower pintle nuts, note locking key be reused. Remove the pintles and carefully remove the rudder to the dock. Move the rudder to covered location for inspection/measurements.
- 3.1.15.** The three pintle bushing diameters shall be measured in three locations along the length and diameters measured in the port/starboard and forward/aft directions. Measurements shall be recorded.

### **Tiller Removal**

- 3.1.16.** It is important to protect the chromed surfaces of the steering gear rams during this work. Contractor shall ensure that chromed surfaces are covered at all times and are never used for support by support slings, blocks, wire straps etc.
- 3.1.17.** There are several lifting eyes welded on the deck head of the steering gear compartment and on tiller. Contractor shall supply and install additional lifting eyes on the deck head as required to carry out this work.
- 3.1.18.** Tiller shall be centered. Disconnect and store eight (8) flexible grease connections. Contractor shall supply eight (8) flexible new lines and charged with grease.
- 3.1.19.** Disconnect and store rudder stock grounding strap. Recessed well area shall be drained and dried.
- 3.1.20.** Remove and store handrails located around rudder well.
- 3.1.21.** Disconnect and store rudder angle pointer and securing brackets, the rudder/helm follow up gear (ship's crew to isolate power prior to removal), hunting gear.
- 3.1.22.** Two hydraulic cylinder/rams shall be blocked or other wise supported, rams shall be disconnected at tiller arm locations and rams pushed into cylinders. Tiller/ram clevis pins shall be reference marked to insure reinstallation in original locations.
- 3.1.23.** Rudder stock shall be supported, secured and centered in position internally and externally to prevent movement in any direction, in order to allow for safe dismantling of tiller and carrier bearing.
- 3.1.24.** Note: reference Wagner dwg D-2388 rev. 8, clearance between tiller and bearing housing is 6mm (1/4"). Actual distance shall be measured and recorded.
- 3.1.25.** The double keyed, split tiller shall be unbolted by straightening the lock tabs and unscrewing the four (4) tiller clamp bolt nuts and removing the bolts. Two (2) half tiller sections shall be removed and stored out of the way. Two (2) Keys shall be marked and removed. Four (4) clamping bolts and nuts shall have threads cleaned.

### **Rudder Stock Removal**

- 3.1.26.** With tiller removed, rudder stock shall be lowered to dock floor.

## **Carrier Bearing**

- 3.1.27.** Radial bearing shall be measured in port/starboard and forward/aft directions at 6 locations spaced equally over the length of the bearing or as directed by Chief Engineer. Readings shall be recorded.
- 3.1.28.** The gland packing ring shall be unbolted and removed along with the five turns of 1" packing. The eight studs shall be thoroughly cleaned. The gland ring shall be cleaned.
- 3.1.29.** The radial bearing shall be removed from the gland packing housing. The mating surfaces shall be thoroughly cleaned to bare metal before reassembly.
- 3.1.30.** The gland packing housing shall be removed to replace the gasket between the housing and ship structure. The securing bolts have welded locks that require removal. The mating surfaces shall be thoroughly cleaned before reassembly. The gasket shall be replaced with a new. The gland housing and radial bearing shall be reassembled as originally found.

## **Inspection**

- 3.1.31.** Rudder and rudder stock palm faces shall be cleaned & inspected. Key ways on stock and rudder palm faces shall be cleaned and checked for cracks by means of dye penetrant method, by qualified personnel.
- 3.1.32.** All palm bolts and nuts shall be cleaned, inspected and lightly hand polished to dress up the nuts and bolts.
- 3.1.33.** Pintles and tapered bores in rudder casting shall be cleaned and inspected. Pintle diameters shall be measured and recorded in two horizontal directions at three vertical positions. A percentage contact fit between pintle tapers and seating (rudder hinge) to be determined by bluing and fitting. All mating surfaces for the pintles and bores shall be cleaned bare metal. Pintle nuts shall be cleaned and inspected.
- 3.1.34.** Palm faces and pintle taper holes shall be protected from the elements at all times. Pintle threads and pilgrim nuts shall be cleaned & inspected.
- 3.1.35.** The machined rudder stock surfaces from stainless steel liner to top of stock shall be degreased and cleaned in preparation for inspection by Chief Engineer and TCMSB.
- 3.1.36.** Machined rudder stock in way of radial bearing shall be measured in both directions in 6 locations as per same location in Carrier Bearing Measurements.
- 3.1.37.** Stainless steel liner diameter shall be measured in both directions in way of packing gland, in at least 2 locations along its length. The liner shall be polished with emery cloth to clean the liner of any burrs or built up harden grease.
- 3.1.38.** Contractor shall polish the machined rudder surfaces to bare metal with dremel tool and/or emery cloth.
- 3.1.39.** The palm bolt holes of the rudder and rudder stock shall be polished with fine emery cloth to clean the machine surfaces to bare metal.
- 3.1.40.** Tiller keyways shall be cleaned and tested for cracks by dye penetrant method and witnessed by Chief Engineer.

- 3.1.41.** All components of carrier bearing and gland housing assembly shall be completely cleaned and degreased and inspected.
- 3.1.42.** Carrier radial bearing shall be measured in both directions and in 6 locations over its length
- 3.1.43.** Bronze thrust plate shall be removed, cleaned and stored in a safe location for inspection by Chief Engineer. Thickness of plate shall be measured along circumference of wear surface in 12 locations in areas designated by Chief Engineer.
- 3.1.44.** Contractor to provide a unit cost of each;
  - Facing of tiller thrust face
  - Facing of thrust plate.
  - Supply of new thrust plateThese 3 unit costs shall be included in the overall bid price and shall be used for adjustments by PWGSC 1379 action.

### **Reassembly**

- 3.1.45.** All grease fittings, drilled pathways and supply tubing shall be proven clear of old grease and filled with new, CCG supplied grease (GSM).
- 3.1.46.** The packing gland housing and radial bearing shall be remounted with new gasket. Securing bolts shall be tightened to specified torque and locked where applicable.
- 3.1.47.** Rudder stock shall be re-shipped and supported in place. Rudder stock in way of radial bearing shall be lightly greased using CCG supplied grease (GSM).
- 3.1.48.** New rudder gland packing shall be supplied and installed complete with packing ring. Packing ring shall be just entered into gland. Further tightening of gland shall be done before and during sea trials as required. Packing (CFM) is 1” square, CHESTERTON Type 329, five (5) turns required.
- 3.1.49.** The thrust plate shall be lightly greased and installed in place.
- 3.1.50.** Tiller arm keys shall be dressed to remove burrs and fitted into keyways.
- 3.1.51.** Tiller half sections shall be bolted and secured in place on the rudder stock ensuring clearance measured is maintained.
- 3.1.52.** Two (2) cylinder rams shall be extended and secured to tiller, and cylinder supports removed.
- 3.1.53.** Rudder angle indicator and securing brackets shall be installed, grounding strap connected. Rudder/helm follow up gear and hunting gear shall be fitted in the same manner prior to removal.
- 3.1.54.** Grease fittings shall be connected and filled with grease. Handrail around recessed well re-installed using new fasteners (CFM).
- 3.1.55.** Rudder and pintles shall be fitted. Pintle nuts secured and locking plates fitted. Rudder shall be proven to swing freely before connecting rudder stock.
- 3.1.56.** Rudder and stock palm flanges shall be mated and secured using Morgrip bolts.
- 3.1.57.** All pintle and Morgrip bolt protective covers shall be fitted and leak proofed with water proof sealant (CFM).
- 3.1.58.** All fairwater plates shall be reinstalled as per original arrangement.

### **3.2 Location**

**3.2.1.** Frame 0 Steering Flat

### **3.3 Interferences**

**3.3.1** Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

**4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer.

**4.1.2.** TCMSB along with the Chief Engineer shall inspect the entire steering arrangement in the disassembled condition and again when completely re-assembled for correct operation.

### **4.2 Testing**

The rudder shall be air tested as specified in the work description.

TCMS and Chief Engineer shall also test correct operation during Dock & Sea Trials.

### **4.3 Certification**

N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

**5.1.1** Three (3) typed copies of all work and measurements taken shall to submitted to Chief Engineer in electronic format.

### **5.2 Spares**

N/A

### **5.3 Training**

N/A

### **5.4 Manuals**

N/A

Spec item #: HD-09	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Ballast Tanks and Voids Cleaning / Inspection / Testing		

## Part 1: SCOPE:

- 1.1 The intent of this specification shall be open Ballast Tanks and Void Tanks for cleaning, inspection, surface preparation and painting. Ballast Tanks are presently used as seawater ballast tanks. Tanks shall be surveyed by TCMSB for credit.
- 1.2 This work shall be carried out in Conjunction with the following:
  - Tank Vent Head Replacement
  - Bubbler Piping Inspection Repairs
  - Aft Peak Tank Renewals

## Part 2: REFERENCES:

### 2.1 Guidance Drawings/Nameplate Data

2.1.1. Tank capacity Plan Drawing # 00-00-14 CCG # T131027

#### **Tanks/Voids to be addressed:**

- 2.1.2. Aft Peak Port WB Tank - Vol: 71.87 M<sup>3</sup>
- 2.1.3. Aft Peak Starboard WB Tank - Vol: 72.44 M<sup>3</sup>
- 2.1.4. # 1 Port Wing FW Tank - Vol: 97.92 M<sup>3</sup>
- 2.1.5. # 1 Starboard Wing FW Tank - Vol: 97.92 M<sup>3</sup>
- 2.1.6. # 2 Port Wing WB Tank - Vol: 186.6 M<sup>3</sup>
- 2.1.7. # 2 Starboard Wing WB Tank - Vol: 186.6 M<sup>3</sup>
- 2.1.8. # 3 Port WB DB Tank - Vol: 55.22 M<sup>3</sup>
- 2.1.9. # 3 Starboard WB DB Tank - Vol: 55.22 M<sup>3</sup>
- 2.1.10. Forward WB Deep Tank - Vol: 239.36 M<sup>3</sup>
- 2.1.11. Forward Void - Refer to Capacity Plan Volume Unknown
- 2.1.12. Aft Port Shaft Void - Refer to Capacity Plan Volume Unknown
- 2.1.13. Aft Starboard Shaft Void - Refer to Capacity Plan Volume Unknown
- 2.1.14. Void Under Thruster Compartment - Refer to Capacity Plan Volume Unknown
- 2.1.15. Aft Void - Refer to Capacity Plan Volume Unknown
- 2.1.16. Doppler Log Compartment - Refer to Capacity Plan Volume Unknown
- 2.1.17. Echo Sounder Speed Log Compt. – Refer to Capacity Plan Volume Unknown

### 2.2 Standards

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)

- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

### **2.3 Regulations**

- 2.3.1. Hull Construction Regulations CSA

### **2.4 Owner Furnished Equipment**

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1. Tanks shall be pumped as low as possible by ship's staff. Contractor shall be responsible for pumping out remainder of tank as required to perform this work. Allow 2 cubic meters for ballast tanks and 0.5 cubic meters for void tanks. Quote shall include unit cost per cubic meter and to be adjusted up or down by 1379 for removing and discarding remaining water.
- 3.1.2. Locations of manhole covers are indicated in drawing. Contractor shall open manhole covers for access for water cleaning and painting purposes. On completion of all work, manhole covers shall be installed using two (2) new ¼" cloth reinforced neoprene gaskets (CFM).
- 3.1.3. Prior to entry into each tank, the tank shall be certified safe for entry and hotwork.
- 3.1.4. The contractor shall remove the vent heads of all tanks / voids with respect to this item and disassemble, clean, prove clear, reassemble but do not re-install until all work is completed and debris removed / tanks & voids inspected prior to Testing.
- 3.1.5. The tanks shall be high pressure washed at 3000 psi to remove mud, scale and loose paint. Contractor shall quote on the removal of approximately 2 M<sup>3</sup> of mud and debris per tank. All water and debris shall be removed from the tanks. Contractor shall be advised that there are no docking plugs in the tanks and water accumulated from pressure washing must be pumped out using Contractor supplied equipment. Tank surfaces shall be thoroughly dried. Tank level transducers shall be protected before high pressure washing.
- 3.1.6. Contractor shall all ensure all mud and debris from pressure washing and cleaning is removed from the tanks and the vessel.

## **Surface Preparation**

- 3.1.7.** Damaged coating, bare, and rusted areas shall be Power Tool Cleaned to bare metal SSPC-SP-11. Feather back to all “intact” existing coating. Debris resulting from power tool cleaning shall be removed from the tanks and discarded.

## **Coating System**

- 3.1.8.** Bare areas shall be coated with two (2) coats with contrasting colors of Amerlock 2 Epoxy to bare areas with sufficient feathering. Apply @ 4 to 8 mils Dry Film Thickness per coat. Total DFT shall be 8 to 16 mils The contractor shall perform the work in accordance with product application instructions with particular attention to the environmental conditions.
- 3.1.9.** The contractor shall quote on 20 M<sup>2</sup> per tank for ballast tanks and 5 M<sup>2</sup> per tank for void tank for surface preparation and coating and the unit cost of each M<sup>2</sup> for surface preparation and coating as described above, the total shall be adjusted up or down by 1379 action.
- 3.1.10.** Following the coating and drying time the contractor shall perform air test on the tanks. A manometer arrangement shall be used for the correct pressure. The vent heads shall be removed for this procedure and replaced when completed with new ¼” neoprene gasket. TCMSB shall witness the test.
- 3.1.11.** Contractor shall supply all ventilation to ensure the complete drying of the first and second coats, and to protect against condensation and humidity.
- 3.1.12.** Before tanks are closed up, CCG personnel will inspect tank level transducers.
- 3.1.13.** Contractor shall install manhole covers in good order with new gaskets.
- 3.1.14.** All work shall be completed to the satisfaction of the TCMSB and Chief Engineer.

## **3.2 Location**

- 3.2.1.** Aft Peak Port WB Tank Frame -3 – 9 Steering Flat
- 3.2.2.** Aft Peak Starboard WB Tank Frame -3 – 9 Steering Flat
- 3.2.3.** # 1 Port Wing FW Tank Frame 123 – 144 Bubbler Compartment
- 3.2.4.** # 1 Starboard Wing FW Tank Frame 123 – 144 Bubbler Compartment
- 3.2.5.** # 2 Port Wing WB Tank Frame 105 – 123 Generator Flat
- 3.2.6.** # 2 Starboard Wing WB Tank Frame 105 – 123 Generator Flat
- 3.2.7.** # 3 Port WB DB Tank Frame 48 – 60 Lube Oil Purifier Flat
- 3.2.8.** # 3 Starboard WB DB Tank Frame 48 – 60 Lube Oil Purifier Flat
- 3.2.9.** Forward WB Deep Tank Frame 123 – 144 Bubbler Compartment
- 3.2.10.** Forward Void Frame 144 – 150 Under and Sides of Chain Locker
- 3.2.11.** Aft Port Shaft Void Frame 27 – 33 Mud Room
- 3.2.12.** Aft Starboard Shaft Void Frame 27 – 33 Mud Room
- 3.2.13.** Void Under Thruster Compartment Frame 27 – 33 Center Mud Room
- 3.2.14.** Aft Void – Frame N – I Below Main Deck
- 3.2.15.** Doppler Log Compartment Port DB Frame 111 – 115
- 3.2.16.** Echo Sounder Compartment Stbd DB Frame 111 - 115

### **3.3 Interferences**

- 3.3.1** Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

- 4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer and the attending TCMSB Inspector.

### **4.2 Testing**

Tanks shall be air tested at 2 PSI or the required pressure requested by TCMSB Inspector.

### **4.3 Certification**

N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

#### **5.1.1**

### **5.2 Spares**

N/A

### **5.3 Training**

N/A

### **5.4 Manuals**

N/A

Spec item #: HD-10	<b>SPECIFICATION</b>	TCMSB Field #: N/A
<b>Bubbler Piping Thickness Testing</b>		

## **Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to take ultrasonic thickness testing of the bubbler piping system located in the Deep Tanks, #2 Water Ballast, and Outer Seaboxes. Measurements shall be taken by an authorized metallurgic technician.
- 1.2 This work shall be carried out in Conjunction with the following:
  - Water Ballast Tank Inspection and Cleaning
  - Seabox Maintenance

## **Part 2: REFERENCES:**

### **2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. Burrard Yarrows Arrangement of Air Bubbler System Piping # 71-10-02
- 2.1.2. Conam Marine Services Air Bubbler Piping FWD Ballast Deep Tank Outboard Manifold – Port Side Looking Outboard
- 2.1.3. Conam Marine Services Air Bubbler Piping FWD Ballast Deep Tank Inboard Manifold – Port Side Looking Outboard
- 2.1.4. Conam Marine Services Air Bubbler Piping FWD Ballast Deep Tank Inboard Manifold – Starboard Side Looking Outboard
- 2.1.5. Conam Marine Services Air Bubbler Piping FWD Ballast Deep Tank Outboard Manifold – Starboard Side Looking Outboard
- 2.1.6. Conam Marine Services Air Bubbler Piping Starboard W2 Ballast Tank - Starboard Side Looking Outboard
- 2.1.7. Conam Marine Services Air Bubbler Piping Port W2 Ballast Tank - Port Side Looking Outboard

### **2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

## **2.3 Regulations**

### **2.3.1.**

## **2.4 Owner Furnished Equipment**

**2.4.1.** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

**3.1.1.** The ballast tanks and seaboxes will be opened up for the testing to be carried out.

**3.1.2.** The branch piping is 90mm diameter Schedule XXH, Manifold Piping is 250mm and 400mm schedule 160.

**3.1.3.** The contractor shall reference the numbered positions on the Conam Sketches to locate the pipe sections and elbows. Measurements shall be taken at 4 positions around the circumference of the pipe sections at three positions over the length of each pipe section, The elbow measurements shall be taken on the outer radius of the pipe elbows.

**3.1.4.** The coating shall be power tool cleaned to bare metal in the area of each if required. Bare areas shall then be coated with two coats of Amerlock 2 VOC compliant epoxy.

**3.1.5.** There are 246 positions on the piping in the ballast tanks. Allow 15 positions on the piping located in the port and starboard outer seaboxes.

**3.1.6.** For bidding purposes allow 2500 shots to be taken. Quote unit cost of 10 shots, including surface preparation and coating, to be adjusted up or down by 1379 action.

### **3.2 Location**

**3.2.1.** Forward Ballast Centerline Deep Tank frame 123 to 144

**3.2.2.** Wing Ballast Tank # 2 Port and Starboard Frame 123 to 105

**3.2.3.** Outer Seabox Port and Starboard Frame 105 to 99

### **3.3 Interferences**

**3.3.1** Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

**4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer.

**4.2 Testing**  
Ultrasonic Testing of Piping.

**4.3 Certification**  
Measurements shall be taken by a certified metallurgic technician.

**Part 5: DELIVERABLES:**

**5.1 Drawings/Reports**

**5.1.1** A type written report in electronic format shall be provided showing the measurements for each position or a mean measurement for each position.

**5.2 Spares**  
N/A

**5.3 Training**  
N/A

**5.4 Manuals**  
N/A

Spec item #: HD-11	<b>SPECIFICATION</b>	TCMSB Field #: N/A
<b>Marelco Seabay Anodes</b>		

## **Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to perform maintenance on the impressed current anodes system for the vessel's seawater cooling system. Work shall be done under the supervision of EMCS Industries, Sydney British Columbia.
- 1.2 This work shall be carried out in Conjunction with the following:
  - Seabox and Seabay Maintenance

## **Part 2: REFERENCES:**

### **2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. Service Manual – Marelco Anti Fouling Impressed Current Seaboxes and Seabays
- 2.1.2. Electrolytic Protection Drawing # 68-00-02

### **2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

### **2.3 Regulations**

- 2.3.1.

### **2.4 Owner Furnished Equipment**

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## Part 3: TECHNICAL DESCRIPTION:

### 3.1 General

- 3.1.1.** Contractor to allow \$15,000.00 in the bid cost for the services of the sub-contractor in addition to the cost of contractor's own work. Final cost shall be adjusted upon proof of invoice from the service provider by 1379 procedure.
- 3.1.2.** New anodes shall be installed under the direction of a Marelco representative. The Marelco representative shall be arranged for by the Contractor. The suggested Marelco representative shall supervise installation and commissioning of the new anodes. The sub-contractor shall be arranged for two separate visits, one for the installation and one for the commissioning aft refloating the vessel.
- Contact: Robert Adie  
ECMS Industries (Marelco)  
E: [robert@emcsmarelco.com](mailto:robert@emcsmarelco.com)  
Commercial: [www.emcsindustries.com](http://www.emcsindustries.com) |  
T: 250.656.5366 ext 206 |C: 604.816.8881 |F: 250.656.5344 |  
Unit 2, Martman Industrial Park, 2042 Mills Rd W, Sidney, BC, V8L 5X4, Canada
- 3.1.3.** Contractor shall inspect and replace designated Marelco system anodes located in the sea boxes and sea bays. Contractor shall replace all 24 anodes – 14 copper, and 10 aluminum.
- 3.1.4.** New anodes (GSM) will be CCG supplied. All anodes shall have watertight glands repacked.
- 3.1.5.** New Marelco anodes are fitted in the following locations:  
Port Seabox: 5 Copper, 5 aluminium  
Starboard Seabox: 5 copper, 5 aluminum  
Suction sea bay: 1 copper  
Discharge sea bay: 3 copper
- 3.1.6.** All anode cables and new anodes shall be tested for continuity before starting work and after replacement. Coast Guard will electrically isolate system before any work is started. Prior to the removal of any anode, the cables terminated within the anode safety cap shall be mechanically disconnected – **NOT CUT**. Connections shall presently be bolted together.
- 3.1.7.** All Marelco system anodes removed shall be stored on the ship in a location as directed by Chief Engineer. NOTE: Contractor shall remove the port & starboard seabay vent pipes for access to some of the port & starboard seabox anodes.
- 3.1.8.** Prior to installation of new anodes, the mounting surface shall be cleaned completely of any corrosion and dirt and dried to ensure a watertight seal. The anodes shall be installed as per mounting instructions attached and at the direction of the service representative. The mounting bolt on each anode shall be torqued to a minimum value of 100 ft-lbs.
- 3.1.9.** Electrical connection of the anode lead and control power cable is with a nut and a bolt. Connections shall be tight and clean. A suitable compound electrical tape shall be used to bind the connection with a final binding of vinyl electrical tape to ensure waterproof integrity.

- 3.1.10.** After any defective cable shall removed and before any new cabling is installed, the Contractor shall air test the conduit piping to ensure the conduit pipe to the anode terminal box is watertight. Air testing shall be carried out at the kick plate connections for the anodes located aft of the DG sets in the Forward Upper Machinery Compartment. After new cabling has been installed, Contractor shall quote on pumping 5 kg of Vaseline into conduit piping through grease fittings on the kick plate connections.
- 3.1.11.** New owner supplied o-rings, 2 per anode, shall be installed in the replaced anode safety caps. Contractor shall fill the safety caps with a silicone, non-conducting grease (CFM) upon completion of all work to be contractor supplied. Suitable anti-seize compound shall be used on the threads of safety caps prior to installing and tightening.
- 3.1.12.** System shall be calibrated by service representative after power has been restored when the vessel is re-floated.
- 3.1.13.** Note: See cleaning of sea boxes and sea bays and for replacement of sacrificial anodes during this work, also for the required marine chemist certificates for confined space entry and hot work.
- 3.1.14.** Chief Engineer shall receive three (3) type written copies of report from service engineer for work carried out on this system.

## **3.2 Location**

- 3.2.1.** Port and Starboard Seaboxes
- 3.2.2.** Forward and Aft Seabays

## **3.3 Interferences**

- 3.3.1** Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

- 4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer and the FSR for the specified work.

### **4.2 Testing** N/A

### **4.3 Certification** N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

**5.1.1** Chief Engineer shall receive a typed written report in electronic format from service engineer for work carried out on this system.

### **5.2 Spares N/A**

### **5.3 Training N/A**

### **5.4 Manuals N/A**

Spec item #: HD-12	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Cathelco ICCP Hull Protection System		

## **Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to replace all 10 anodes and 4 reference cells for the hull impressed current system. The services of an authorized Cathelco representative shall supervise the work and provide guidance for repairs.
- 1.2 This work shall be carried out in Conjunction with the following:
  - Underwater hull coating repair
  - Ballast Tank and Void Tank Inspections

## **Part 2: REFERENCES:**

### **2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. Wilson Walton Service Manual And Drawings

### **2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

### **2.3 Regulations**

- 2.3.1. Hull and Construction Regulations

### **2.4 Owner Furnished Equipment**

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated. Owner will supply new anodes and reference cells.

## Part 3: TECHNICAL DESCRIPTION:

### 3.1 General

- 3.1.1.** The contractor shall allow \$10,000.00 in its bid for the subcontracted services as well as travel and living, in addition to the cost of the contractor's own work. This shall be adjusted by 1379. The work of this item will require opening up and certifying gas free tanks and spaces identified under the location heading of this spec.
- 3.1.2.** All work dealing with the anodes including installation shall be done under the direction of a Cathelco representative. Cathelco representative shall be arranged for by the Contractor and payment of any costs incurred for this requirement shall be paid by the contractor and included in the known work. The suggested Cathelco representative shall supervise installation of the new anodes is as follows:  
Jastram Technologies  
Technical Support  
Ph: 902-468-6450  
Fax: 902-468-6901
- 3.1.3.** Contractor shall open up all 14 cofferdams and remove the Vaseline from each cofferdam. All cables shall be disconnected at the cofferdams or nearby junction boxes. The anodes and reference cells shall be removed from the hull and discarded. The cable glands shall be removed from the hull penetration and the cofferdams conduit branch. New cable glands sized to suit the cables shall be installed.
- 3.1.4.** All 10 elliptical anodes shall be removed from the hull and discarded. Contractor shall allow for repairing and or replacing 25% of the damaged studs. Drill and tap new stud holes to match the bolt pattern of the new anodes. Allow for 4 holes per anode.
- 3.1.5.** The Dielectric shield areas, out to a 3 meter radius from the anodes shall be Abrasive Blasted to SSPC-SP 10 Near White Blast Cleaning. The area shall be built up with Intergard 822 epoxy compound, 6 mm thick at the anodes to 1mm thick at the edge. Special surface preparation and coating behind the anode shall be as specified by the FSR. **Refer to Hull Inspection spec for coating requirements in and around the anodes.** The new anodes shall be seated in the epoxy coated during application. The application shall be applied before the anti corrosive and anti fouling paint. It's important to ensure that anodes and reference electrodes are completely covered with plywood during high-pressure water washing, grit blasting and painting operations. Contractor shall supply and install Intergard 822 epoxy filler around the ten (10) hull anodes and fair to contour specified by the FSR.
- 3.1.6.** The four reference cells shall be removed from the hull recess. The recesses shall be thoroughly cleaned. The new reference cells shall be installed and the area around the cells shall be filled with Intergard 822 epoxy filler flush with the hull plating.

### Other Required Work

- 3.1.7.** Access to shaft tunnels for reference electrodes is via hatches in Mud Compartment. This is not considered a confined space, however hot work restrictions apply.
- 3.1.8.** All ten anodes and four reference cells shall have hull anode cofferdam flange covers removed. Vaseline shall be cleaned from cofferdams. All watertight glands shall be inspected for possible leakage.
- 3.1.9.** All cabling and anodes shall be meggered tested. Leads shall be re-connected to anodes/electrodes and cables and anodes/electrodes checked for continuity. Leads shall be re-connected to power supply. The ships Electrical Officer shall witness the megger readings.
- 3.1.10.** Before the cofferdams are filled with Vaseline, the vessel must be floated to check for leaks and prove all glands are tight.
- 3.1.11.** Upon completion of inspection and above work, all cofferdams shall be filled with Vaseline. Contractor shall quote on supplying and installing 40 KG of Vaseline to fill the cofferdams when the work is completed.
- 3.1.12.** Cofferdam flange covers shall be installed using new neoprene gaskets and fasteners (both CFM). All nuts and bolts shall be coated with anti-seize compound.
- 3.1.13.** All staging (including staging in the dock for anode/electrode external inspection) equipment, lighting, ventilation equipment, tools shall be Contractor supplied.
- 3.1.14.** Chief Engineer to receive three (3) type written copies of report from service engineer and work carried out on this item.
- 3.1.15.** All work shall be completed to the satisfaction of TCMSB and Chief Engineer.

### **3.2 Location**

- 3.2.1.** Location of anodes and reference electrodes is as follows:
- 3.2.2.** Anodes #'s 1 & 3 Frame 121, starboard
- 3.2.3.** Anodes #'s 2 & 4 Frame 121, port
- 3.2.4.** Anode # 5 Frame 60, starboard
- 3.2.5.** Anode # 6 Frame 60, port
- 3.2.6.** Anodes #'s 7 & 9 Frame 30, starboard
- 3.2.7.** Anodes #'s 8 & 10 Frame 30, port
- 3.2.8.** Reference electrodes a & b Frame 108, port & starboard
- 3.2.9.** Reference electrodes c & d Frame 45, port & starboard
- 3.1.16.** Cofferdams for the above anodes & electrodes are located inside the following tanks:
  - # 2 wing water ballast tanks, port and starboard, Frames 105 – 123
  - # 3 double bottom water ballast tanks, port & starboard, Frames 48 – 60
  - Shaft tunnel voids, port & starboard, Frames 27 – 33
  - Shaft tunnels, port & starboard, Frames 44 – 45

### **3.3 Interferences**

- 3.3.1** Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

- 4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer and the FSR for the Impressed Current System.

### **4.2 Testing**

N/A

### **4.3 Certification**

N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

- 5.1.1** The Chief Engineer shall receive a typed written report in electronic format from Cathelco Service Representative for work carried out on this system.

### **5.2 Spares**

N/A

### **5.3 Training**

N/A

### **5.4 Manuals**

N/A

Spec item #: HD-13	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Fuel / Miscellaneous Oil Tank Cleaning / Inspection / Testing		

## Part 1: SCOPE:

- 1.1 The intent of this specification shall be to open, to gas free and clean the identified tanks suitable for hot work and Transport Canada Marine Safety Branch inspection (as noted).
- 1.2 This work shall be carried out in Conjunction with the following:

## Part 2: REFERENCES:

### 2.1 Guidance Drawings/Nameplate Data

- 2.1.1. Tank Capacity Plan # T13-1027

### 2.2 Standards

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

### 2.3 Regulations

- 2.3.1. Transport Canada Hull Construction Regulations.

### 2.4 Owner Furnished Equipment

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## Part 3: TECHNICAL DESCRIPTION:

### 3.1 General

- 3.1.1. The following tanks are to be addressed as per this specification;
  - . No 1 Double Bottom Port 71.34 M<sup>3</sup> Fr 105 – 123
  - i. No 1 Double Bottom Stbd 71.34 M<sup>3</sup> Fr 105 – 123
  - ii. No 3 Wing Port 267.51 m3 Fr 60 - 99
  - iii. No 3 Wing Stbd 264.88 m3 Fr 60 - 99

iv.	No 4 Wing Port	84.24 m <sup>3</sup>	Fr 48 - 60
v.	No 4 Wing Stbd	86.88 m <sup>3</sup>	Fr 48 - 60
vi.	No 5 Wing Port	100.56 M <sup>3</sup>	Fr 33 - 48
vii.	No 5 Wing Stbd	104.65 M <sup>3</sup>	Fr 33 - 48
viii.	No 6 Wing Port	65.74 M <sup>3</sup>	Fr 27 - 33
ix.	No 6 Wing Stbd	66.37 M <sup>3</sup>	Fr 27 - 33
x.	No 7 Wing Port	170.16 M <sup>3</sup>	Fr 9 - 27
xi.	No 7 Wing Stbd	171.22 M <sup>3</sup>	Fr 9 - 27
xii.	Day Tank Port	36.54 M <sup>3</sup>	Fr 87 - 99
xiii.	Day Tank Stbd	30.45 M <sup>3</sup>	Fr 89 - 99
xiv.	Emerg Gen Tank Stbd	6.09 M <sup>3</sup>	Fr 87 - 89
xv.	Fuel Oil Sludge Port DB	8.63 M <sup>3</sup>	Fr 107 - 110
xvi.	Oily Bilge Tank Port DB	29.32 M <sup>3</sup>	Fr 94 - 99

- 3.1.2.** The TA will advise the Contractor which tanks are available for cleaning to allow adequate time for ships staff to transfer fuel. The tanks will be pumped as low as possible.
- 3.1.3.** Prior to entry into tank, the tank shall be certified safe for entry and hotwork.
- 3.1.4.** Contractor shall quote for the removal and disposal of estimated 1 m<sup>3</sup> of oil/sludge residue per tank. The disposal of all residues from the tanks must be by a licensed waste oil disposal company. The total amount of residue, excluding residue from water washing of tanks, shall be totaled and amount given to Chief Engineer. Contractor shall supply the name of the collection and disposal company along with the disposal receipts, to the TA. Contractor shall quote unit cost for removal and disposal of 1 m<sup>3</sup> of oil/sludge for PWGSC 1379 adjustment. Contractor shall provide an accurate means of measuring the removed residue through the use of flow meters or tank sounding devices.
- 3.1.5.** Contractor shall supply all ventilation and lighting equipment required for the Hot-Work certificates and to maintain the equipment for the duration of the work. Gas-free/Hot-Work certificates shall be maintained and renewed as required. For the purposes of work arising, the Contractor shall quote a unit cost to gas-free a fuel oil tank for PWGSC 1379 adjustment.
- 3.1.6.** Contractor shall remove manhole covers for access to tanks and install covers in good order after the final inspection by the TA. All dirt and debris found in tanks shall be removed ashore and disposed of by Contractor to an approved location.
- 3.1.7.** The tank internals are to be 100 percent high pressure washed at 3000 psi minimum. All water and residue from tank washing shall be pumped ashore and disposed of by Contractor. Tanks shall be thoroughly wiped down with lint-free clean rags and all sludge deposits scraped off and disposed. During the water washing process, contractor will take care not to direct a stream of water at a tank's level transducer. Each level transducer is located at a low point in the tank, usually adjacent to a manhole location. Exact location can be made by following the cable inside the tank. The level transducers must be covered up prior to any water washing of the tank.
- 3.1.8.** Before disinfecting tanks, Contractor shall arrange with TCMSB for inspection and inform the TA prior to their arrival.

- 3.1.9. Each fuel tank shall be sprayed or wiped (depending on tank access) with a 10 / 90 solution of Javex in water. **IMPORTANT** – extraction ventilation and employee eye protection will be required during this procedure. Each tank so sprayed shall be allowed to soak 4 to 8 hours.
- 3.1.10. After tanks have been disinfected, all surfaces shall be wiped dry with lint-free rags. Contractor shall remove protective covers from the level transducers.
- 3.1.11. After tank cleaning is completed, while gas-free certificate is still valid, CCG personnel will be inspecting tank gauging level sensors in tanks and prove operable. After sensors are inspected, the TA will advise Contractor when tanks can be closed up.
- 3.1.12. Any tanks requiring survey by TCMSB shall be tested with air pressure at 1.5 PSI by Contractor to the satisfaction of the attending Marine Safety Inspector. All tests shall be witnessed by the TA as well as the Marine Safety Inspector. The quote shall include the installation and removal of blanks/balloons for suction, sounding pipes, overflow pipes, vent head removal (vents to be removed prior to any work commencing, dis-assembled, cleaned, re-assembled, proven clear and re-installed after all work completed) and additional tank entries for subsequent balloon/blank adjustments. Contractor shall advise TA prior to reinstalling manhole cover after successful pressure test so that the TA may view the tank.
- 3.1.13. Before any tank is closed up, the manhole cover shall be inspected by the TA. All tank fasteners shall be wire brushed clean and coated with an approved anti-seize compound. Contractors shall include in quotation to supply and install new ¼ inch thick neoprene gaskets for replacement on the subject tanks.

#### **Part 4: PROOF OF PERFORMANCE:**

##### **4.1 Inspection**

All work shall be completed to the satisfaction of the TA.

##### **4.2 Testing**

All testing (air pressure test) shall be witnessed by TCMSB and TA.

##### **4.3 Certification**

N/A

#### **Part 5: DELIVERABLES:**

##### **5.1 Drawings/Reports**

5.1.1 The Chief Engineer shall receive a typed written report in electronic format from the Contractor for work carried out on this system and tests performed.

##### **5.2 Spares N/A**

##### **5.3 Training N/A**

##### **5.4 Manuals N/A**

Spec item #: HD-14	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Bilge & Ballast Pump Overboard Discharge Pipe		

## **Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to replace the section of pipe leading to the bilge and ballast pump overboard discharge valve.
- 1.2 This work shall be carried out in Conjunction with the following:

## **Part 2: REFERENCES:**

### **2.1 Guidance Drawings/Nameplate Data**

#### **2.1.1.**

### **2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

### **2.3 Regulations**

#### **2.3.1.**

### **2.4 Owner Furnished Equipment**

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** The contractor shall replace the sections of piping leading to the Bilge & Ballast pump overboard discharge valve. The pipe is bolted flanged at the valve and grooved Victaulic connection thereafter.
- 3.1.2.** The contractor shall remove the section of piping to be replaced that leads forward along the port outboard bulkhead above # 1 Main Engine approximately 25 feet to where it bends inboard.
- 3.1.3.** The pipe consists of several elbows for offset purposes to where it leads inboard. Allow for six bends (90's) and 20 Victaulic coupling seals.
- 3.1.4.** The contractor shall fabricate using new piping the pipe sections and reinstall.
- 3.1.5.** The contractor shall use pipe that is 5 inch Ø, schedule 40, galvanized. The entire pipe section shall be replaced with new pipe and Victaulic fittings. All pipe sections shall be hot dipped galvanized.
- 3.1.6.** The contractor shall pressure test all welded seams of piping for leaks.
- 3.1.7.** The contractor shall test the system for leaks after reinstallation of the piping with the system ran up in the presence of the chief engineer.
- 3.1.8.** All pipe, fittings, material used shall be contractor supply.

### **3.2 Location**

- 3.2.1.** Engine Room Port over # 1 Main Engine

### **3.3 Interferences**

- 3.3.1** Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

- 4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer.

### **4.2 Testing**

- 4.2.1** System shall be functionally tested for leaks, contractor to correct any issues found.

### **4.3 Certification**

- Welders to be CWB certified.

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

**5.1.1** The Chief Engineer shall receive a typed written report in electronic format from the Contractor for work carried out on this system and tests performed.

### **5.2 Spares N/A**

### **5.3 Training N/A**

### **5.4 Manuals N/A**

Spec item #: HD-15	<b>SPECIFICATION</b>	TCMSB Field #: N/A
<b>Seabox Maintenance</b>		

## **Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to open the port and starboard sea boxes for cleaning, coating repair, and TCMSB inspection. Contractor shall ensure marine chemist certificates for these areas for confined space entry and hot-work are obtained and kept valid as per the Coast guard Fleet Safety manual.
- 1.2 This work shall be carried out in Conjunction with the following:
  - Bubbler Piping Inspection
  - Sea Valve Maintenance
  - Seawater Impressed current anode system

## **Part 2: REFERENCES:**

### **2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. Port Sea Box Volume 70 m<sup>3</sup>
- 2.1.2. Starboard Sea Box Volume 70 m<sup>3</sup>
- 2.1.3. Tank Capacity Plan Drawing # T13 1027
- 2.1.4. Shell Expansion

### **2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

### **2.3 Regulations**

- 2.3.1. Hull Construction Regulations CSA

## 2.4 Owner Furnished Equipment

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## Part 3: TECHNICAL DESCRIPTION:

### 3.1 General

- 3.1.1. Cleaning of sea boxes is not to be carried out until the completion of hull pressure washing and hull grit blasting, unless suitable internal protection is provided.
- 3.1.2. Access to sea boxes is by removal of manhole covers located on the Main Deck: port sea box manhole which is located in the Incinerator Compartment (frame 100 port); starboard sea box manhole cover is located in the starboard engine room entrance, forward of the day tank (frame 100 starboard).
- 3.1.3. Each sea box comprises an inner and outer sea box with a longitudinal division plate extending vertically 3/4 the height of the compartment.
- 3.1.4. All inlet grids and internal sea box and sea bay surface areas shall be thoroughly cleaned by high pressure fresh water washing to remove all loose scale, paint, marine growth etc. Debris from this cleaning shall be removed from ship and disposed of ashore on a daily basis.
- 3.1.5. Grid holes in shell and all manhole covers shall be cleaned by hydro-blasting or reaming using a close fitting drill. Diameter of each grid hole perforation is 25 mm.
- 3.1.6. Upon completion of fresh water pressure washing and disposal of debris from the sea boxes and sea bays, Contractor shall arrange for inspection with Chief Engineer and TCMSB.
- 3.1.7. In each outer sea box lower area as designated by the Chief Engineer, Contractor shall renew the remaining 8 fitted sacrificial anodes four (4) x 40 lb. sacrificial anodes in each outer sea box. Total of eight x 40 lb. anodes shall be replaced.
- 3.1.8. IMPORTANT: The aft bulkhead in each sea-box at frame 99, port & starboard sides, is contiguous with tanks containing fuel oil.
- 3.1.9. **CONTRACTOR SHALL ENSURE THERE IS NO BURNING OR WELDING CARRIED OUT ON THESE BULKHEADS. CONTRACTOR SHALL ADVISE ALL WORKERS IN THESE AREAS OF THE POTENTIAL HAZARDOUS SITUATION.**

- 3.1.10.** Contractor shall quote on mechanically cleaning and painting 50 m<sup>2</sup> in each sea box internal surfaces (100 m<sup>2</sup> Total), including bubbler pipe-work passing through sea boxes, suitable for application of two (2) coats of Amercoat 339 coating. Surface preparation and paint application shall be to manufacturer's recommendations. Power-tool clean to SSPC-SP3 or hand-tool clean SSPC-SP2. Before paint application, all surfaces shall be clean, dry and free of all contaminants including salt deposits. The contractor is advised that any over-millage condition will result in improper curing and subsequent potable water contamination. The contractor shall quote a unit cost for preparation and coating per one m<sup>2</sup> for 1379 PWGSC adjustment purposes.
- 3.1.11.** When mechanical scaling and cleaning is being done, a temporary cover for each sea-box manhole cover shall be fitted by Contractor. During this cleaning Contractor will install an extraction fan on each sea-bay inlet grid or sea-box ventilation pipe to create a negative pressure in the sea-box to prevent dirt & debris from the mechanical cleaning from entering the Incinerator Compartment or the Engine Room change area as applicable. The following pipe outlets in each sea-box shall also be temporarily covered to prevent the ingress of dirt & debris during scaling & cleaning operations: main suction, inner & outer sea-box discharges, evaporator brine overboard, fire monitor inlet.
- 3.1.12.** Contractor shall follow paint manufacturer's recommendations for surface preparation, application and curing are strictly adhered to.
- 3.1.13.** On completion of all work, sea boxes shall be inspected by Chief Engineer prior to closing up. Manhole covers shall be securely refitted after final inspection. Contractor shall supply and fit new ¼" neoprene gaskets (CFM) on all manhole covers and apply anti-seize compound to all securing studs.
- 3.1.14.** All staging, ventilation equipment and materials required to carry out above work shall be provided by Contractor.
- 3.1.15.** All equipment in the Incinerator Compartment, starboard Engine Room casing entrance and passageways through Winch Compartment shall be protected against dirt and damage during the time this work is in progress. These areas shall be left in "an as clean as found" condition on completion of the work.

## **3.2 Location**

- 3.2.1.** Port Sea Box 99 – 105
- 3.2.2.** Starboard Sea Box 99 – 105

## **3.3 Interferences**

- 3.3.1** Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

- 4.1.1. All work shall be completed to the satisfaction of the Chief Engineer.
- 4.1.2. TCMSB Hull surveyor shall inspect the spaces before coatings are applied.

**4.2 Testing**  
N/A

**4.3 Certification**  
N/A

**Part 5: DELIVERABLES:**

**5.1 Drawings/Reports**

- 5.1.1 The Chief Engineer shall receive a typed written report in electronic format from the Contractor for work carried out on this system and tests performed.

**5.2 Spares**  
N/A

**5.3 Training**  
N/A

**5.4 Manuals**  
N/A

Spec item #: HD-16	<b>SPECIFICATION</b>	TCMSB Field #: N/A
<b>Sea Valves and Overboard Discharges</b>		

**Part 1: SCOPE:**

- 1.1** The intent of this specification shall be to open up the sea valves, overboard discharge valves, and deicing valves for maintenance, cleaning and inspection by TCMSB.
- 1.2** This work shall be carried out in Conjunction with the following:
- Seabay and Seabox Maintenance
  - Central Cooling and Seawater Isolation Valve Replacement
  - Underwater Hull Coating

**Part 2: REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

**2.1.1. Valve List**

**MAIN SEA VALVES (Direct sea connections)**

Sea Inlet w/ air actuator	Port	Fr 101-102	Butterfly, 18"
Discharge to Inner Seabox w/ air actuator	Port	Fr 103-104	Butterfly, 12"
Discharge to Outer Seabox w/ air actuator	Port	Fr 103-104	Butterfly, 12"
Sea Inlet w/ air actuator	Stbd	Fr 101-102	Butterfly, 18"
Discharge to Inner Seabox w/ air actuator	Stbd	Fr 103-104	Butterfly, 12"
Discharge to Outer Seabox w/ air actuator	Stbd	Fr 103-104	Butterfly, 12"

**MISC SUCTION VALVES (Direct sea connections)**

Fire Monitor Pump Suction w/ air actuator	Port	Fr 105-106	Butterfly, 10"
Fire Monitor Pump Suction w/ air actuator	Stbd	Fr 105-106	Butterfly, 10"
Evaporator Suction from Sea	Center	Fr 100-101	Globe, 3"
Evaporator Suction Vent	Center	Fr 100-101	Gate, 2"
Fire & Bilge Pump Suction From Sea	Port	Fr 58-59	Globe, 5"
Fire & Bilge Pump Suction From Sea Vent	Port	Fr 58-59	Globe, 2"

**OVERBOARD DISCHARGE VALVES (Direct sea connections)**

Chain Locker Bilge Pump O/B	Port	Fr 142-143	Globe, 1"
Sewage & Grey Water O/B	Stbd	Fr 112-113	Globe, 2.5"
Oily Water Separator O/B	Stbd	Fr 118-119	Globe, 2.5"
Unknown/Unused (Blanked) O/B	Stbd	Fr 97-98	Globe, 2.5"
Fire & GS Pump O/B	Port	Fr 113-114	Globe, 5"
Bilge & Ballast Pump O/B	Port	Fr 90-91	Globe, 5"
Fire & Bilge Pump O/B	Port	Fr 59-60	Globe, 5"

Reverse Osmosis O/B	Port	Fr 100-101	Globe, 3"
Reverse Osmosis O/B	Stbd	Fr 100-101	Globe, 3"
Stern Tube Cooling	Port	Fr 33-34	Globe, 2"
Stern Tube Emgy Cooling	Port	Fr 33-34	Globe, 2"
Stern Tube Cooling	Stbd	Fr 33-34	Globe, 2"
Stern Tube Emgy Cooling	Stbd	Fr 33-34	Globe, 2"

**COMPRESSED AIR DE-ICING VALVES (Direct sea connections)**

Sea Inlet Air	Port	Fr 101-102	Globe, 3/4"
Discharge to Inner Seabox Air	Port	Fr 103-104	Globe, 3/4"
Discharge to Outer Seabox Air	Port	Fr 103-104	Globe, 3/4"
Fire Monitor Suction Air	Port	Fr 105-106	Globe, 3/4"
Sea Inlet Air	Stbd	Fr 101-102	Globe, 3/4"
Discharge to Inner Seabox Air	Stbd	Fr 103-104	Globe, 3/4"
Discharge to Outer Seabox Air	Stbd	Fr 103-104	Globe, 3/4"
Fire Monitor Suction Air	Stbd	Fr 105-106	Globe, 3/4"
Chain Locker Bilge Pump O/B Air	Port	Fr 142-143	Globe, 1/2"
Sewage & Grey Water O/B Air	Stbd	Fr 112-113	Globe, 1/2"
Oily Water Separator O/B Air	Stbd	Fr 118-119	Globe, 1/2"
Unknown/Unused (Blanked) Air	Stbd	Fr 97-98	Globe, 1/2"
Evaporator Suction from Sea Air	Center	Fr 100-101	Globe, 1/2"
Fire & Bilge Pump Suction From Sea Air	Port	Fr 58-59	Globe, 1/2"
Fire & GS Pump O/B Air	Port	Fr 113-114	Globe, 1/2"
Bilge & Ballast Pump O/B Air	Port	Fr 90-91	Globe, 1/2"
Fire & Bilge Pump O/B Air	Port	Fr 59-60	Globe, 1/2"
Reverse Osmosis O/B Air	Port	Fr 100-101	Globe, 1/2"
Reverse Osmosis O/B Air	Stbd	Fr 100-101	Globe, 1/2"

**SEABAY VALVES (NOT direct sea connections)**

Fwd Seabay Vent	Port	Fr 102-103	Butterfly, 6"
Fwd Seabay Vent	Stbd	Fr 102-103	Butterfly, 6"
Aft Seabay Vent	Port	Fr 99-100	Butterfly, 6"
Aft Seabay Vent	Stbd	Fr 99-100	Butterfly, 6"
Port Sea water Pump Suction	Port	Fr 100-101	Butterfly, 10"
Center Sea Water Pump Suction	Port	Fr 100-101	Butterfly, 10"
Stbd Sea Water Pump Suction	Stbd	Fr 100-101	Butterfly, 10"
Fwd Seabay Pump Down Suction	Center	Fr 102-103	Butterfly, 3"
Aft Seabay Pump Down Suction	Center	Fr 101-102	Butterfly, 3"
Fire & GS Pump Suction	Port	Fr 101-102	Butterfly, 5"
Emgy Fire Pump Suction	Port	Fr 99	Butterfly, 5"
Bilge & Ballast Pump Suction	Port	Fr 99	Butterfly, 5"
Fire & Bilge Pump Suction from Seabay	Port	Fr 99	Butterfly, 5"
Cooler Discharge to Seabay	Port	Fr 104-105	Butterfly, 8"
Cooler Discharge to Seabay	Stbd	Fr 104-105	Butterfly, 8"

**OTHER VALVES (NOT direct sea connections)**

Main Recirc Valve w/ air actuator	Port	Fr 102-103	Butterfly, 12"
Main Recirc Valve w/ air actuator	Stbd	Fr 102-103	Butterfly, 12"
Main Strainer Outlet	Port	Fr 101-102	Butterfly, 18"
Main Strainer Outlet	Stbd	Fr 101-102	Butterfly, 18"

**2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

**2.3 Regulations**

- 2.3.1. Marine Machinery Regulations

**2.4 Owner Furnished Equipment**

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

**Part 3: TECHNICAL DESCRIPTION:****3.1 General**

- 3.1.1. All valves shall be labeled and marked to ensure the valves are returned to the correct location and position correctly between the flanges.
- 3.1.2. All valves listed in section 2.1.1 shall be overhauled and prepared for survey by TCMSB. Valves shall be dismantled, all parts thoroughly cleaned, seating surfaces lightly lapped in and parts laid out in good order for survey. Butterfly valves shall have the disc and seat cleaned with solvent compatible with the seat material. The valve actuation shall be proven to operate freely.

- 3.1.3.** The six valves listed under heading Main Sea Valves (Direct Sea Connections) shall be completely disassembled and rebuilt with new CCG supplied parts as deemed necessary.
- 3.1.4.** The valves listed above that have pneumatic/electric actuators will be isolated by ship's staff. Contractor to tag and remove actuators and store in a safe location. Actuators have an air line and two cables connected to the actuators, one cable is for the limit switches and the other is the power to the solenoid. Actuators are not to be dismantled. It is important to have the Chief Engineer's designate present when actuators are removed and installed.
- 3.1.5.** Reverse Osmosis Suction Valve located at frame 99-100 is an Angle SDNR 75mm valve. This valve is located in the lower forward machinery compartment and is connected to the shell bottom via a pipe approximately 8" dia x 10 feet long that runs from the tank top of the suction sea bay to the bottom of the ship. The grid plate at the shell inlet must be removed (4 bolts). With evaporator suction valve closed, the piping is shall be thoroughly flushed with high pressure water to remove all marine growth. The pipe shall be wire brushed to remove loose scale. Pipe shall be painted as per Anti Friction Hull Coating. Grid plate shall be installed with new SS fasteners (CFM).
- 3.1.6.** Note: Fire & Bilge pump suction pipe extends down through # 3 DB ballast tank to the bottom of the ship. This pipe is 12" dia x 10 ' long. The remains of 2 anodes to be cut off. With valve in place & in closed position, Contractor to ensure entire length of pipe is high pressure washed to remove marine growth, then grit blasted to bare steel, then paint applied as per underwater hull coating system. After hull paint has cured, Contractor to supply & spot weld in place 2 x 6 # zinc anodes.
- 3.1.7.** Contractor shall quote on replacing three ½" flanged de-icing valves and five ¾" flanged de-icing valves using new neoprene gaskets and stainless steel fasteners. De-icing valves removed are to be given to the Chief Engineer.
- 3.1.8.** After valves have been inspected by Chief Engineer and TCMSB all valves shall be re-assembled in good order using neoprene gasket material where applicable, best quality teflon packing correctly sized and fastenings wire brushed clean and coated with anti-seize. Any disconnections or other removals necessary to carry out this work shall be included in quotation and installed on completion of work. This includes extended spindles, actuators, piping connections etc.
- 3.1.9.** Contractor to exercise extra care when installing butterfly valves such that rubber insert pieces are not damaged during assembly. Flanges for butterfly valves are to be tightened evenly.
- 3.1.10.** All valves are to be functionally tested for proper mechanical operation before ship is re-floated.
- 3.1.11.** Following the work the contractors QA representative and owner's representative shall view each valve to ensure they are assembled fully and fasteners tightened.

## **3.2 Location**

- 3.2.1.** As per valve list in section 2.1.1

### **3.3 Interferences**

- 3.3.1** Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

**4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer.

**4.1.2.** TCMSB shall inspect all disassembled valves.

### **4.2 Testing**

Valves shall be tested for tightness during flooding of the Seabays and re-floating of the vessel.

### **4.3 Certification**

N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

**5.1.1** The Chief Engineer shall receive a typed written report in electronic format from the Contractor for work carried out on this system and tests performed.

### **5.2 Spares**

N/A

### **5.3 Training**

N/A

### **5.4 Manuals**

N/A

Spec item #: HD-17	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Port Shafting System Alignment		

### **Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to check the alignment of the port shaft system from the gearbox running aft. The alignment of the two port main engines to the gearbox shall be confirmed.
- 1.2 This work shall be carried out in Conjunction with the following:  
HD-06 Port Tailshaft Replacement and Survey

### **Part 2: REFERENCES:**

#### **2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. Installation Alignment Main Engines & Gearboxes & Propulsion Shafting # 61-00-SK45
- 2.1.2. Propulsion Machinery HD Bolts & Chocks # 60-00-04
- 2.1.3. TFOX Tailshaft

#### **2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

#### **2.3 Regulations**

- 2.3.1.

#### **2.4 Owner Furnished Equipment**

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

### **Part 3: TECHNICAL DESCRIPTION:**

#### **3.1 General**

- 3.1.1.** The following is Wartsila's General Process for Alignment, to be considered only estimations.
- Typically the team requires one day prior to the docking of a vessel.
  - One day prior to the shaft dismantling for a reference measurement – hull deflection when compared to the pre docking measurement.
  - One day for measurements of the intermediate shafting, to be left in place.
  - One day for measurements with the tailshaft removed and free line of sight to the intermediate shaft aft coupling.
  - New calculation for evaluation of current alignment.
  - In-situ machining may be required.
  - Depending on the findings, the repair process will be adapted to the requirements.
  - After repair we need one day for the final set of measurements and installation of portable monitoring system.
  - In total we would estimate approximately 10 days, but to be integrated in the docking schedule.
- 3.1.2.** Contractor shall obtain the services of Wartsila Propulsion Alignment Specialist to perform the specified work. Contractor shall have an allowance of \$50,000.00 for their services and adjusted by 1379 following proof of invoice. Allow 2 days to perform pre-drydocking alignment checks as reference. Allow 2 days prior to shaft dismantling for a reference measurement hull deflection when compared to pre-docking measurement. Allow 2 days for alignment checks while tailshaft is removed during drydock and a free line of sight to the intermediate shaft. Allow 10 days for the alignment and subsequent adjustments while the vessel is floated after drydocking. The contractor shall provide 3 workers to assist in the alignment procedures.
- 3.1.3.** The top half of the three shaft bearings shall be removed and laid aside. The bearing shells are to be rolled out as required for the removal of the chockfast or as per the Wartsila specialist.
- 3.1.4.** The shaft line consists of three shaft bearings. The two forward bearings are presently set on chockfast resin and the aft bearing is set on adjustable steel chocks. The chockfast shall be removed from the two forward bearings and fitted with adjustable steel chocks the same as the fitted under the aft bearing. The bearing and structural seat shall be thoroughly cleaned to a flat surface, any proud areas shall be ground smooth. Contractor shall allow \$15,000.00 for the purchase of 8 steel adjustable chocks (Vibro-chock) to suit the application, to be adjusted by 1379 following proof of invoice.
- 3.1.5.** The final alignment procedure shall be completed while the vessel is afloat and following the drydocking portion of the refit.
- 3.1.6.** The alignment check shall make use of strain gauges, load measuring gauges, displacement, and laser alignment equipment.
- 3.1.7.** The three shaft bearings shall be aligned as instructed by the Wartsila Alignment Specialists.
- 3.1.8.** The No 1 and No 2 main engine alignment to the Port gearbox is to be verified afloat during the Wartsila pre-docking alignment checks.

**3.1.9.** The contractor shall obtain the services of a certified Laser Alignment technician to carry out an evaluation of the alignment of the main engines to the Port Gearbox. Any brackets required for conducting measurements are to be fabricated and installed. The alignment checks are to be conducted with the clutches installed.

**3.1.10.** The contractor is to provide a separate quote for the removal of one main engine clutch, to be adjusted by 1379 action.

### **3.2 Location**

**3.2.1.** Port side Shaft Tunnel

**3.2.2.** Port Side Aft Lower Auxiliary Machinery Compartment

**3.2.3.** Aft Main Engine Room

### **3.3 Interferences**

**3.3.1** Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

**4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer.

### **4.2 Testing**

Dock Trial and Sea Trails

### **4.3 Certification**

N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

**5.1.1** Provide copies of Wartsila service reports and alignment reading.

**5.1.2** Provide copies of the main engine to gearbox alignment readings.

Spec item #: HD-18	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Port Tailshaft Coupling & Morgrip Bolts		

## **Part 1: SCOPE:**

**1.1** The intent of this specification shall be to install the new port tailshaft coupling to the existing intermediate shaft.

**1.2** This work shall be carried out in Conjunction with the following:

- Port Tailshaft Replacement
- Port Propeller Survey

## **Part 2: REFERENCES:**

### **2.1 Guidance Drawings/Nameplate Data**

**2.1.1.** Wartsila LIPS Service Manual and Drawings

**2.1.2.** Fig # 2 Arrangement of Shafting # A0 06759

### **2.2 Standards**

**2.2.1.** The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.

**2.2.2.** Canadian Coast Guard Fleet Safety Manual (DFO 5737)

**2.2.3.** Coast Guard ISM Confined Space Entry 7.D.9

**2.2.4.** Coast Guard ISM Hotwork procedures

**2.2.5.** Coast Guard ISM Fall Protection procedures

**2.2.6.** Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)

**2.2.7.** CWB CSA 47.1 latest revision Division I, II or III

**2.2.8.** SSPC-SPT

### **2.3 Regulations**

**2.3.1.**

### **2.4 Owner Furnished Equipment**

**2.4.1.** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** All work is to be carried out under the supervision of the Wartsila Propulsion Technician as part of the new tailshaft installation.
- 3.1.2.** Contractor shall fit the MORGRIP BOLTS on the port tail shaft coupling flange to intermediate shaft aft flange, 12 bolts per shaft line. The procedure listed below is for one shaft line only. The port tail shaft coupling is a new coupling.
- 3.1.3.** A copy of the MORGRIP Operator's Instruction and Safety Manual will be made available to the successful Contractor.
- 3.1.4.** In conjunction with HD – 06 Port Tailshaft Replacement and Survey, Contractor shall use either jig boring or jig drilling and reaming of the coupling flange bolt holes and shaft flange bolt holes 'in-situ' after installation of the shaft and new coupling has been fitted.
- 3.1.5.** Any turning of the shaft for this operation will be carried out by ship's staff.
- 3.1.6.** The Contractor is to ensure that all MORGRIP bolt holes jig bored or jig drilled and reamed are truly in line and of a common diameter throughout their combined length.
- 3.1.7.** Contractor to check out the 'in-situ' boring arrangements required to carry out this work. Entrance to each Shaft Compartment is normally via the fitted access hatch. For the port tail shaft coupling, an access hole is to be cut to allow for the removal of the original coupling to the Mud Compartment & the installation of the new coupling from the Mud Compartment to the Shaft Compartment – see HD – 06. If additional access to facilitate boring equipment is required, sections of the shaft compartment deckhead can be cut out through to the Mud Compartment. The Contractor shall include the cost of cutting any access holes and replacement of same in the specification bid. No access holes will be cut without the approval of the Chief Engineer.
- 3.1.8.** Each set of coupling holes shall be bored, measured and marked. The information from each hole will then determine the respective MORGRIP bolt. Each bolt is to be marked to correspond with the coupling bolt hole. Temporary bolts will have to be used to ensure the coupling / flange alignment is strictly maintained during the boring process.
- 3.1.9.** Contractor to record the new bolt hole diameters and the corresponding MORGRIP bolt diameters in a report to the Chief Engineer.
- 3.1.10.** Each coupling and shaft shall be bolted up as required by the specification item using the recommended hydraulic pressures.

### **3.2 Location**

- 3.2.1.** Port side shaft tunnel.

### **3.3 Interferences**

**3.3.1** Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

**4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer.

### **4.2 Testing**

N/A

### **4.3 Certification**

N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

**5.1.1**

### **5.2 Spares**

N/A

### **5.3 Training**

N/A

### **5.4 Manuals**

N/A

Spec item #: HD-19	<b>SPECIFICATION</b>	TCMSB Field #: N/A
#2 Port & Stbd DB F/O Tank Repair		

## **Part 1: SCOPE:**

- 1.1** The intent of this specification shall be to prepare port and starboard # 2 DB fuel oil tanks for repair to a suspected leak in the centerline oil tight bulkhead. To obtain a five year survey credit for both tanks from TCMSB.
- 1.2** This work shall be carried out in Conjunction with the following:

## **Part 2: REFERENCES:**

### **2.1 Guidance Drawings/Nameplate Data**

- 2.1.1.** Tank Capacity Plan
- 2.1.2.** Tank Top Plan
- 2.1.3.** Double Bottom Frame 60-99
- 2.1.4.** Tank Vol: 127 M<sup>3</sup> each
- 2.1.5.** Frames 60-94

### **2.2 Standards**

- 2.2.1.** The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2.** Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3.** Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4.** Coast Guard ISM Hotwork procedures
- 2.2.5.** Coast Guard ISM Fall Protection procedures
- 2.2.6.** Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7.** CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8.** SSPC-SPT

### **2.3 Regulations**

- 2.3.1.** Hull Construction Regs

### **2.4 Owner Furnished Equipment**

- 2.4.1.** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** The tanks will be pumped down to the suction levels by the ship's crew. The contractor shall remove the remaining fuel from the tanks. Allow for removal of 3 M<sup>3</sup> for each tank and quote unit cost for each additional 1 M<sup>3</sup>. This will be adjusted by 1379 following proof of invoice.
- 3.1.2.** Each tank is fitted with 6 manhole covers. The tanks' internal structure and shape make access difficult within the tanks. The tanks are fitted with overflow pipes that lead to the overflow tank and are fitted with wafer type swing check valves. Each tank is fitted with two vent pipes that shall be removed prior to any work commencing.
- 3.1.3.** The 12 manhole covers shall be removed for access to the tanks. Following the work, the manhole covers shall be replaced with new 1/4" thick Buna N rubber gaskets with the centers removed. The two forward outboard covers are fitted with lever type level floats.
- 3.1.4.** The tanks are to be gas freed for entry and hotwork. The tanks shall be cleaned and ragged dry. All rags and debris shall be removed from the tanks.
- 3.1.5.** One of the tanks shall be pressure tested to determine the location of the leak at the centerline line girder. Suspect the leak to be in the area of frame 72-84.
- 3.1.6.** The contractor shall obtain the services of a qualified Marine Consultant to provide a repair procedure. The procedure shall be submitted to TCMSB for approval.
- 3.1.7.** The contractor shall allow for replacing 1 M<sup>2</sup> x 13mm thick Grade A steel plate. Allow for 4 meters of weld seams. Following repair of the leak, the welds shall be NDT tested as per instructions in the repair procedure.
- 3.1.8.** Each tank shall be pressure tested individually to prove the repair is correct. The check valves in the overflow pipes shall be blanked for the pressure test.
- 3.1.9.** Following successful testing, all blanks to be removed, vents and valves to be replaced with new gaskets.
- 3.1.10.** The contractor shall provide the services of TCMSB Approved Marine Consultants to perform an internal inspection of both tanks and provide a report to TCMSB to obtain a survey credit. The pressure testing shall be part of the survey credit. The inspection shall be conducted following the work.

### **3.2 Location**

- 3.2.1.** Frame 60 – 94 Double Bottom Tanks, Main Engine Room

### **3.3 Interferences**

- 3.3.1** Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

**4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer.

**4.1.2.** Inspection of all work shall be witnessed by TCMSB or a delegated inspector.

### **4.2 Testing**

NDT tested shall be completed by approved testing company. All reports shall be forwarded to TCMSB.

Pressure tests shall be witnessed by TCMSB.

### **4.3 Certification**

All reports shall be submitted to the Chief Engineer in a type written format.

## **Part 5: DELIVERABLES:**

### **5.2 Drawings/Reports**

#### **5.1.1**

### **5.3 Spares**

N/A

### **5.4 Training**

N/A

### **5.5 Manuals**

N/A

Spec item #: E-01	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Sterntube Water Quality System Installation		

## **Part 1: SCOPE:**

- 1.1** The intent of this specification shall be to install a new water quality filtering system to protect the sterntube bushings and sterntube shaft seals for the port and starboard shaft systems. The two units to be fitted in the lower mud room. Relocate existing duplex filter from the engine room to the lower mudroom. Install pipe runs and cabling to and from the units. CuNi 90/10 pipe will be used from the discharge of the duplex filter to the sterntube/seal housing.
- 1.2** This work shall be carried out in Conjunction with the following:
- HD-05 Port Propeller Survey
  - HD-06 Port Tailshaft Replacement
  - HD-07 Port Sterntube Bushing Replacement
  - HD-13 Fuel Tank Cleaning

## **Part 2: REFERENCES:**

### **2.1 Guidance Drawings/Nameplate Data**

- 2.1.1.** General Arrgt Of WQS (P&ID) # H32023-01-B
- 2.1.2.** WQS Skid Dimensions 1113D x 859W x 1804Hmm
- 2.1.3.** WQS Guidance Sketch
- 2.1.4.** Duplex Filter – Eaton Filtration Model 53BTX 4-inch.

### **2.2 Standards**

- 2.2.1.** The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2.** Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3.** Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4.** Coast Guard ISM Hotwork procedures
- 2.2.5.** Coast Guard ISM Fall Protection procedures
- 2.2.6.** Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7.** CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8.** SSPC-SPT

## **2.3 Regulations**

### **2.3.1. Marine Machinery Regulations**

## **2.4 Owner Furnished Equipment**

- 2.4.1.** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.
- 2.4.2.** CCG will supply the two WQS skid units.
- 2.4.3.** CCG will supply CuNi 90/10 piping and fittings.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** The contractor shall ensure the # 4 DB Fuel Settling Tank below the lower mudroom is gas freed for hotwork.
- 3.1.2.** The contractor shall be given an allowance of \$5,000.00 for Wartsila technician to commission the two WQS systems. The allowance shall be adjusted up or down following proof of invoice.
- 3.1.3.** Contractor shall be given an allowance of \$10,000.00 for piping and fittings to be adjusted up or down following proof of invoice by 1379.
- 3.1.4.** A seat arrangement shall be fabricated and installed to allow mounting the WQS skids. Refer to Wartsila WQS drawings for size and bolt pattern. Refer to guidance sketch for approximate location and orientation of the units. Generally the location will be just forward of the existing pipe rack and starboard of the center line. Angle bar 3 inch x 3/8 inch wall shall be used for the seat and welded to the tank top. The units shall be bolted to the seats. The orientation will have the control panel forward and to starboard on the skids.
- 3.1.5.** A seat arrangement for the duplex filter shall be fabricated and installed starboard of the skids units. Angle bar 3 inch x 3/8 inch wall shall be used for the seat and welded to the tank top.
- 3.1.6.** The skid units shall be lowered to the lower Mud Room and mounted on the seats. The existing duplex filter shall be relocated from between the shaft generators in the engine room to the Lower Room.
- 3.1.7.** A single saveall shall be fitted to surround the units and duplex filter for water retention. The flat bar shall be 3 inch x 3/16" with continuous weld on the inside and staggered on the outside.
- 3.1.8.** The pipe arrangement where the duplex filter was located between the shaft generators shall be modified to remove the elbows, fittings, valves and have the pipe runs straight through to the bulkhead at frame 60. Allow for 10 feet of 3 inch galvanized pipe to be replaced. Allow for 6 elbows to offset the pipe run to the bulkhead. Pipe shall be Victaulic Grooved pipe connections. Existing pipe and fittings shall be reused where possible.

- 3.1.9.** The pipe run from the aft side of bulkhead at frame 60 shall be modified to connect to a Victaulic bulkhead penetration at frame 48, the aft bulkhead of the lube oil purifier compartment. The existing pipe run in the lube oil purifier compartment shall be removed in its entirety. The pipe run is overhead from frame 60 to port and starboard at frame 48. The new pipe run from frame 60 to 48 shall be under the deck plates and vertically up at frame 48 to the bulkhead connection located starboard of the starboard purifier heater 1 meter above the deck plates. The bulkhead connection is a 5 inch grooved Victaulic fitting, a 3-5” reducer shall be fitted at the connection. Allow for 10 meters of 3 inch schedule 80 galvanized pipe and 6 elbows for turns and offsets.
- 3.1.10.** A new pipe run shall be installed in the lower mud room to connect to the inlet of the duplex filter. The pipe run shall be from the 5 inch Victaulic bulkhead connection located aft side of bulkhead frame 48. A 5-3” reducer shall be fitted at the connection. The pipe shall be run to starboard about 1 meter and vertically up to under the tween deck. The pipe shall run aft to follow the existing pipes runs for a distance to the center of the duplex filter, then run to port above the duplex filter and vertically down to connect to the inlet of the duplex filter. A 3 inch Victaulic ball valve shall be fitted in the vertical pipe run before the duplex filter. The inlet of the duplex filter is bolted flange, a flanged Victaulic connection shall be fitted here. Allow for 12 meters of 3” schedule 80 galvanized pipe to be fitted. Allow for 8 elbows for turns and offsets.
- 3.1.11.** The piping sections and fittings from the outlet of the duplex filter to both systems shall be Cu-Ni 90/10. A DN100, double sweep tee shall be fitted to the outlet of the duplex filter. Two concentric reducers DN100 to DN65 shall be fitted to the tee at each side. Bronze, 2 ½” bolted flange screw lift valves shall be fitted in each pipe section to the units. The two pipe sections shall be fitted from the valves to the WQS inlet. Allow for 5 meters of DN65 pipe, one – DN100 bolted flange 150# class, seven – DN65 bolted flanges 150# class, six – DN65 90° elbows, four – DN65 45° elbows, two – DN100-DN65 concentric reducers, one – DN100 double sweep Tee. Fittings shall be butt weld. Flanges shall be weld neck.
- 3.1.12.** The DN40 discharge pipe sections from both units to the sterntube/seals in the port and starboard shaft tunnels shall be Cu-Ni 90/10. The starboard unit pipe run shall be from the outlet of the starboard unit vertically up to the deckhead of the lower mud room, outboard to the starboard for a distance above the inboard side of the shaft tunnel, aft to bulkhead at frame 33, vertically downward to penetrate the deck into the shaft tunnel. The penetration into the shaft tunnel shall be fitted with a watertight gland suitable for the pipe size. The exact location of the penetration shall be determined on site. The pipe in the shaft tunnel shall connect to the existing stainless steel valves. A 1 inch branch shall be installed from the 2 inch pipe to the stainless steel valve for the sterntube seal flushing. The port unit pipe run shall be vertically up to near the deck head of the lower mud room and below the center line beam, outboard to port to the port side of the centerline beam, aft to the bulkhead at frame 33, outboard to port for a distance above the inboard side of the shaft tunnel, vertically downward to penetrate the deck into the shaft tunnel.

- 3.1.13.** The penetration into the shaft tunnel shall be fitted with a watertight gland suitable for the pipe size. The exact location of the penetration shall be determined on site. The pipe in the shaft tunnel shall connect to the existing stainless steel valves. A DN25 branch shall be installed from the DN40 pipe to the stainless steel valve for the sterntube seal flushing. The end of the DN40 pipe shall be fitted with a concentric reducer DN50-40 and a DN50 Flange to connect to the existing valve. Allow for 20 meters of DN40 Cu-Ni pipe, six – DN40 bolted flanges 150# class, 20 – DN40 - 90° elbows, ten DN40 - 45° elbows, 3 – DN40 tee with DN25 branch single sweep, 4 meters of DN25 pipe, eight – DN25 90° elbows, four – DN25 45° elbows, three – DN25 bolted flanges 150# class. Fittings shall be butt weld. Flanges shall be weld neck The pipe arrangement in the shaft tunnels shall be prearranged to allow the correct flow to the seal housing and the sterntube.
- 3.1.14.** The cyclone separator purge overboard pipe run from each unit shall be DN20 CuNi 90/10 pipe. The pipe run shall connect to the fire and bilge pump overboard discharge located in the lube oil purifier compartment. The pipe runs shall be vertically up from the units, port to 1.6 meters port of the center line, forward over the flume hood to the forward bulkhead at frame 48, down to penetrate the bulkhead at 300mm below the deckhead of the lube oil purifier compartment. The penetrations shall be fitted with watertight glands suitable for the pipe size. The pipe runs shall run forward to just aft of frame 60 to connect to the horizontal 5 inch pipe of the fire and bilge pump overboard. The overboard discharge of the pump shall be fitted with two ¾” schedule 80 branches from the top of the pipe and fitted with bolted flanges leading aft. Two bronze screw down non-return valves 150# class shall be fitted to the branches. The valves shall be orientated horizontally. The two pipe runs shall connect to the valves with bolted flanges. Avoid traps and minimize bends as much as possible. Allow for four - bolted flanges DN20 150# class, twenty - 90° elbows DN20, twenty - 45° elbows DN20, 40 meters of DN20 pipe. Fittings shall be butt weld. Flanges shall be weld neck
- 3.1.15.** A compressed air line shall be installed to each unit. A compressed air pipe shall be fed from an existing pipe located at the aft bulkhead of the lower room frame 33. New ½” stainless steel tubing shall be branched into the existing pipe, run vertically up overhead, forward and to the starboard, then branched to feed the two units. A 50µm filter shall be fitted to the new pipe at bulkhead frame 33, The filter arrangement shall be piped to have a bypass and valves fitted on each side of the filter and in the bypass pipe. Valves shall be fitted at the inlet of the manifold for each WQS unit. Valves shall be stainless steel, lockable handles, with compression connection for ½” tubing. The connection at the air inlet to each unit is G1/4” – ISO 228 female. Allow for 10 meters of ½” stainless steel tubing, 10 compression elbows, 10 compression Tees.

- 3.1.16.** The electrical connection for both units will utilize existing cables from the redundant seal cooling system, port and starboard. These cables are terminated in two junction boxes locate at frame 48 bulkhead in the lower mud room, one starboard of stairs and the other port of the workbench. The existing junction boxes shall be replaced with two metal NEMA type 2 enclosures 12”x12”x4”. The enclosure shall be mounted to the bulkhead on standoff angle bar. The enclosures shall be fitted with backing plates, din rails and terminal strips to connect the existing cables and new cables from the WQS units. The existing cables for each side are 8C / #14 for remote start circuit, 4C / #14 supply powers, two shielded signal cables for the AMS. The existing cables shall be terminated in the new enclosures. New cables shall be installed from the WQS control panels to the new junction boxes. Cables shall be run overhead in the lower mud room. Cable trays shall be installed overhead to neatly transit the cables from the WQS units near the bulkhead at frame 48. Allow for 30 meters of each cable to complete the connection from the WQS units to the new junction boxes.
- 3.1.17.** New stop/start illuminated push buttons shall be installed in the MCR console below the steering pump stop/start push buttons. Stop shall be red and start shall be green. These shall be connected to TB50 under the console. Refer to ship’s console drawing for correct terminations.
- 3.1.18.** All piping shall be fitted with pipe supports at 1 meter intervals. Supports to be welded to surrounding structure and the piping to be wrapped with rubber sheet material IWO pipe clamps.
- 3.1.19.** All disturbed or new Victaulic grooved couplings shall be fitted with new seals. Style #77 for Joining Couplings.

## **3.2 Location**

- 3.2.1.** Lower Mud Room
- 3.2.2.** Aft Lower Auxiliary Machinery Space (Lube Oil Purifier Compartment)
- 3.2.3.** Main Engine Room Aft
- 3.2.4.** MCR

## **3.3 Interferences**

- 3.3.1** Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

- 4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer.

## **4.2 Testing**

4.2.1 WQS units shall be commissioned by Wartsila Canada

## **4.3 Certification**

N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

**5.1.1** The Chief Engineer shall receive a typed written report in electronic format from the Contractor for work carried out on this system and tests performed.

### **5.2 Spares**

N/A

### **5.3 Training**

N/A

### **5.4 Manuals**

N/A

Spec item #: E-02	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Safety Valve Re-certification		

**Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to have 37 safety valves recertified for TCMSB. Valves will be removed and reinstalled by ships crew.
- 1.2 This work shall be carried out in Conjunction with the following:

**Part 2: REFERENCES:**

**2.5 Guidance Drawings/Nameplate Data**

**2.1.4. List of Valves:**

<b>Tag</b>	<b>Serial #</b>	<b>Pressure</b>	<b>Size</b>
# 2 Service Air Comp 1 <sup>st</sup> Stage	NV3821	60 PSI	¼” NPT
# 2 Service Air Comp 2 <sup>nd</sup> Stage	NV2157	145 PSI	¼” NPT
# 2 Service Air Comp Discharge	NV2153	145 PSI	1” NPT
# 2 Start Air Comp 2 <sup>nd</sup> Stage	NV2168	33 BAR	¾” BSP
# 2 Start Air Comp 1 <sup>st</sup> Stage	NV2166	6.6 BAR	1 ¼” BSP
Emergency Air Comp 1 <sup>st</sup> Stage	NV2156	60 PSI	¼” NPT
Emergency Air Comp 2 <sup>nd</sup> Stage	NV2160	260 PSI	¼” NPT
Emergency Air Comp 3 <sup>rd</sup> Stage	NV37826	1300 PSI	¼” NPT
Whistle Buffer Tank	NV2151	100 PSI	1” NPT
Main Eng 1&2 Buffer Tk (Clutch)	NV3714	115 PSI	1” NPT
Main Eng 3&4 Buffer Tk (Clutch)	NV2152	115 PSI	1” NPT
Main Eng # 1 Control Air Rec.	NV2155	120 PSI	¾” NPT
Main Eng # 2 Control Air Rec.	NV2154	120 PSI	¾” NPT
Main Eng # 3 Control Air Rec.	NV2163	120 PSI	¾” NPT
Main Eng # 4 Control Air Rec.	NV2170	120 PSI	¾” NPT
Main Air Bottle FWD	NV24348-2	430 PSI	1” NPT
Main Air Bottle AFT	NV24348-1	430 PSI	1” NPT
# 1 Start Air Comp 1 <sup>st</sup> Stage	NV23312	6.6 BAR	1 ¼” BSP
# 1 Start Air Comp 2 <sup>nd</sup> Stage	NV2167	33 BAR	¾” BSP
Winch Control Bottle FWD	NV2171	120 PSI	3/8” NPT
Winch Control Bottle AFT	NV2172	120 PSI	3/8” NPT
M/E Clutch Air Reducing Station	NV2162	105 PSI	¾” NPT
Whistle Reducing Station	NV2150	105 PSI	¾” NPT
M/E Control Air Reducing Station	NV2169	100 PSI	¾” NPT
# 1 Service Air Comp 1 <sup>st</sup> Stage	NV2231	60 PSI	¼” NPT
# 1 Service Air Comp 2 <sup>nd</sup> Stage	NV3719	145 PSI	¼” NPT
# 1 Service Air Comp Discharge	NV2235	145 PSI	1” NPT
# 1 Service Air Bottle	NV2234	145 PSI	1” NPT

Spare	NV00397	150 PSI	1" NPT
F/O Quick Closing Valve System	NV4184	110 PSI	¼" NPT
F/O Quick Closing Valve System	NV4185	110 PSI	¼" NPT
Spare (Vidmars)	NV00396	150 PSI	1" NPT
Spare (Vidmars)	NV02824	150 PSI	1" NPT
Spare (Vidmars)	NV3712	115 PSI	1" NPT
Spare (Vidmars)	NV3713	115 PSI	1" NPT
Spare (Vidmars)	NV3711	15 PSI	¾" NPT
Spare (Vidmars)	NV02551	150 PSI	¾" NPT
Spare (Vidmars)	NV2161	60 PSI	½" NPT

## 2.1 Standards

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT
- 2.2.9. NIST and NRC

## 2.2 Regulations

- 2.3.1. Marine Machinery Regulations - CSA

## 2.3 Owner Furnished Equipment

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## Part 3: TECHNICAL DESCRIPTION:

### 3.1 General

- 3.1.1. The above valves shall be transported to an authorized valve testing facility for service, testing, and recalibration. The valve shall be in sent in two deliveries to allow the service air to remain in service during the work. The first delivery will be all valves with the exception of 3 valves, which shall be sent in the second delivery.
- 3.1.2. The valves shall be returned to the vessel for installation by the ships crew.
- 3.1.3. An allowance of \$10,000.00 shall be quoted for the sub-contractor work and adjusted by 1379 procedure following receipt of invoice.

### **3.2 Location**

**3.2.1.** Various areas of the vessel.

### **3.3 Interferences**

**3.3.1** Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

**4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer & TCMS.

### **4.2 Testing**

As specified by NIST

### **4.3 Certification**

As specified by NIST

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

**5.1.1** Original certificates for the recertification of all valves shall be given to the Chief Engineer.

**5.1.2** The Chief Engineer shall receive a typed written report in electronic format from the Contractor for work carried out on this system and tests performed.

### **5.2 Spares**

N/A

### **5.3 Training**

N/A

### **5.4 Manuals**

N/A

Spec item #: E-03	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Gearbox Lube Oil Pumps Surveys (3)		

**Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to open up the three (3) Gearbox Oil Pumps for inspection, Gearbox Standby Oil Pump Stbd, Port Gearbox Oil Pump and Stbd Gearbox Oil Pump for overhaul and to obtain survey credit for TCMSB.
- 1.2 This work shall be carried out in Conjunction with the following:

**Part 2: REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

- 2.1.1. Gearbox Pump ACG
- 2.1.2. IMO Screw Pump – Stbd Stby gearbox Oil Pump & Electric Driven Motor.  
Oil Pump Data:  
Make: IMO AB Industries  
Type: ACF 80.3 N3F  
Serial # Electric Driven: 260074  
Manufacturer: Elektro Technik  
Frame Size: M160L4  
HP & Speed: 17.5Kw @ 1750  
V/Ph/Hz: 440/3/60
- 2.1.3. IMO Screw Pumps – Port and Starboard Gearbox Oil Pumps Gear Driven.  
Oil Pump Data:  
Make: IMO AB Industries  
Type: ACF 80.3 N3F

**2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

## **2.3 Regulations**

### **2.3.1.**

## **2.4 Owner Furnished Equipment**

**2.4.1.** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** The three pumps shall be removed from their fitted location for disassembly. The pumps shall be disassembled, cleaned and laid out for inspection by TCMSB. All removed covers and flanges shall be marked for reassembly purposes. Coupling position shall be measured on the shaft for correct positioning during reassembly.
- 3.1.2.** Pumps shall be reassembled with new CCG supplied seals and orings. Units shall be fitted in their original location with new flange gaskets.
- 3.1.3.** The attached pressure regulating valve on the gearbox pumps shall be disassembled and laid out for inspection for TCMSB. Valve shall be reassembled following inspection.
- 3.1.4.** The pump units shall be locked out by the contractor's lockouts. The vessel's lockout book shall be recorded.
- 3.1.5.** The motor shall be labeled for correct orientation to ensure it is reinstalled on the correct pump and in the correct position. The power supply cables shall be disconnected and labeled. The motor shall be removed from the pump housing and sent to an authorized electric motor refurbishment facility.
- 3.1.6.** The motor shall be completely disassembled for routine maintenance, inspection and testing. Work shall include but not limited to the following; rotor shaft measurements and run-out, flange face run-out, spigot run-out, shaft end play, bearing housing measurements and run-out, clean dip and bake, dynamic balance, resistance test, bench test run, and vibration readings. New bearings shall be installed. The contractor shall bid an allowance of \$10,000 for parts / bearings.
- 3.1.7.** Motor shall be reconnected and rotation proven correct before the pumps are operational.
- 3.1.8.** Motors shall be return to the vessel and installed on its appropriate pump. It is important to check for the correct rotation of the motor for each pump as the reverse rotation will destroy the pump during start up. The contractor shall ensure the coupling is not binding when the pumps are assembled. Power cables shall be reconnected and glands to be watertight.

### **3.2 Location**

**3.2.1.** Port and Starboard Propulsion Gearboxes

### **3.3 Interferences**

- 3.3.1** Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

- 4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer and attending TCMSB.

### **4.2 Testing**

- 4.2.1** Pumps shall be operationally tested for correct rotation & pressure.

### **4.3 Certification**

N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

- 5.1.1** The Chief Engineer shall receive a typed written report in electronic format from the Contractor for work carried out on this system and tests performed.

### **5.2 Spares**

N/A

### **5.3 Training**

N/A

### **5.4 Manuals**

N/A

Spec item #: E-04	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Port & Stbd CPP Oil Distribution Box Overhaul		

## Part 1: SCOPE:

**1.3** The intent of this specification shall be to remove the Oil Distribution Boxes from the gearboxes and transport to a local Wartsila repair facility or designated location specified by the Wartsila FSR for complete overhaul.

**1.4** This work shall be carried out in Conjunction with the following:

- Port Tailshaft Replacement
- Port Propeller Survey

## Part 2: REFERENCES:

### 2.1 Guidance Drawings/Nameplate Data

- 2.1.1.** Wartsila LIPS Service Manual and Drawings
- 2.1.2.** Fig # 10 Arrangement of Control Unit # A2 09462 / 1593184
- 2.1.3.** Fig # 8 Valve Block Assembly # A0 06807 / 4620257
- 2.1.4.** Fig # 11 Assembly Electric/Hydraulic Control Unit w/Feedback # A1 07645 / 0500171 or W000500305
- 2.1.5.** Fig # 17 Assembly Valve # A2 07549 / 0530056
- 2.1.6.** Fig # 18 Assembly Transmitter Box # A2 20096 /
- 2.1.7.** Fig #4 Oil Distribution Unit # A0 06806 / 0400438

### 2.2 Standards

- 2.2.1.** The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2.** Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3.** Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4.** Coast Guard ISM Hotwork procedures
- 2.2.5.** Coast Guard ISM Fall Protection procedures
- 2.2.6.** Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7.** CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8.** SSPC-SPT

### 2.3 Regulations

- 2.3.1.**

## **2.4 Owner Furnished Equipment**

**2.4.1.** The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

**3.1.1.** The contractor shall obtain the services of a Wartsila Propulsion Technician to overhaul the entire OD boxes including transmitter unit and feedback unit. The contractor shall have an allowance of \$50,000.00 for the services and to be adjusted by 1379 following proof of invoice. All the work shall be under the supervision of the Wartsila FSR.

**3.1.2.** The propeller pitch shall be placed in full astern position prior to the work been carried out. The bypass valve on the header tank located in the emergency generator room shall be open and drained back to the sump. The oil shall be drained from both systems at the OD boxes and disposed of. Allow 1200 liters of Petro Canada AW68 hydraulic oil. This work is specified for the port side in a separate spec item.

**3.1.3.** All electrical disconnections are to be carried out under the supervision of the Electrical Officer to confirm tagging of the wires.

**3.1.4.** All hoses, electrical wires and brackets shall be disconnected, labelled, and laid aside in protective coverings. Opened ended hydraulic hoses shall be fitted with blank flanges or pipe fittings. The open ports on the OD boxes shall be blanked with flanges or pipe fittings.

**3.1.5.** The flange at the gearbox and OD boxes shall be disconnected. The OD box shall be supported during the removal process. The OD boxes shall be transported to the designated location for overhaul. The units shall be completely disassembled, inspected and reassembled by qualified machinists using new CCG supplied parts. The overhaul of the units shall be performed as per manufacturer's instructions. The units shall be returned to the vessel and reconnected as originally found.

**3.1.6.** The systems shall be filled with new hydraulic oil Petro Canada AW 68 and the trapped air vented to atmosphere.

**3.1.7.** The pitch settings shall be calibrated both mechanically and software related. OD Box levers and pointers shall be set to match the fitted scales.

**3.1.8.** Prior to Sea Trials, the propulsion will have to be operational to determine zero pitch setting for the propellers blades.

### **3.2 Location**

**3.2.1.** Forward side of propulsion gearboxes between the port and starboard engines.

### **3.3 Interferences**

**3.3.1** Contractor is responsible for the identification of interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

**4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer.

### **4.2 Testing**

N/A

### **4.3 Certification**

N/A

## **Part 5: DELIVERABLES:**

### **5.1 Drawings/Reports**

**5.1.1**

### **5.2 Spares**

N/A

### **5.3 Training**

N/A

### **5.4 Manuals**

N/A

Spec item #: L-01	<b>SPECIFICATION</b>	TCMSB Field #: N/A
Foremast Navigation Light Repositioning		

**Part 1: SCOPE:**

- 1.1 The intent of this specification shall be to reposition of the Foremast Navigation Light as the existing position of this light prevents the light from being viewed as 360 degrees. Replace cabling from the mast lights to the junction box in the dry stores.
- 1.2 This work shall be carried out in Conjunction with the following:

**Part 2: REFERENCES:**

**2.1 Guidance Drawings/Nameplate Data**

**2.1.1.**

**2.2 Standards**

- 2.2.1. The following Coast Guard Standards and or Technical Bulletins must be adhered to in the course of executing this specification. Copies of these standards and bulletins can be obtained from the CCG Technical Authority.
- 2.2.2. Canadian Coast Guard Fleet Safety Manual (DFO 5737)
- 2.2.3. Coast Guard ISM Confined Space Entry 7.D.9
- 2.2.4. Coast Guard ISM Hotwork procedures
- 2.2.5. Coast Guard ISM Fall Protection procedures
- 2.2.6. Canadian Coast Guard Welding Specifications for Ferrous Materials, Revision 4. (TP6151 E)
- 2.2.7. CWB CSA 47.1 latest revision Division I, II or III
- 2.2.8. SSPC-SPT

**2.3 Regulations**

- 2.3.1. Canada Shipping Act

**2.4 Owner Furnished Equipment**

- 2.4.1. The contractor shall supply all materials, equipment, and parts required to perform the specified work unless otherwise stated.

## **Part 3: TECHNICAL DESCRIPTION:**

### **3.1 General**

- 3.1.1.** Scaffolding or manlift will be required to perform the work, supplied by the contractor.
- 3.1.2.** The anchor light and mount needs to be moved to the top of the foremast. The existing top mount shall be removed and replaced with the existing anchor light mount. The lanyard mount leading aft shall be reinstalled id removed with the existing top mount. The existing position of this light prevents the light from been viewed at 360 degrees.
- 3.1.3.** The contractor shall install steel plates from the ladder rails to the mast IWO of the masthead and the two towing lights. This is required to cover the glare from the light from during night sailing, it impedes their night vision. The new lights are wider and extend slightly from the mast diameter. The plates shall extend slightly above and below the height of the light. They shall be positioned not to impede the 225° angle of the light.
- 3.1.4.** The contractor shall replace all navigation light cables from the foremast to the junction box located in the dry stores forward of the mess room. CCG will supply the cable. A total of 8 cable runs 800 feet. Replace terminal strip in junction box located in the dry stores. The transit from the Foscle deck to the main deck shall be repacked with rotex transit blocks.
- 3.1.5.** The contractor shall install new stainless steel cable tray the entire length of the foremast to carry the cables. The cables shall be secured to the tray with stainless steel wraps. The tray shall be secured to the mast with stainless steel flat bars.
- 3.1.6.** The cables entering the light fixture glands shall be fitted with heat shrink to completely cover the cable and the gland. The marine braid shall be pulled back for entry into watertight glands and transit blocks.
- 3.1.7.** All disturbed steel or new steel shall be coated with two coats of primer and two coats of top coat. All disturbed coating shall be power tooled backed to intact coating. CCG shall supply coatings. The coatings shall be applied before lights are mounted.

### **3.2 Location**

- 3.2.1.** Foremast

### **3.3 Interferences**

- 3.3.1** Contractor is responsible for the identification of all interference items, their temporary removal, storage and refitting to vessel.

## **Part 4: PROOF OF PERFORMANCE:**

### **4.1 Inspection**

**4.1.1.** All work shall be completed to the satisfaction of the Chief Engineer.

**4.2 Testing**  
N/A

**4.3 Certification**  
N/A

**Part 5: DELIVERABLES:**

**5.1 Drawings/Reports**

**5.1.1** The Chief Engineer shall receive a typed written report in electronic format from the Contractor for work carried out on this system and tests performed.

**5.2 Spares**  
N/A

**5.3 Training**  
N/A

**5.4 Manuals**  
N/A